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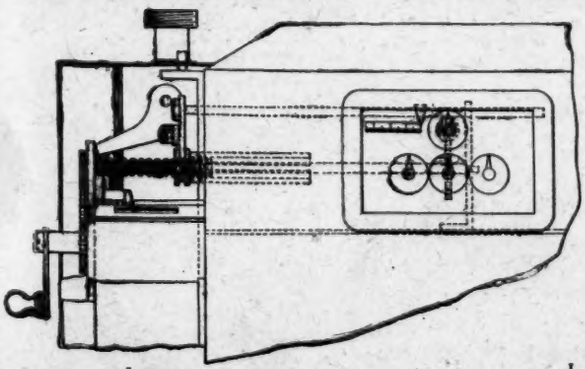

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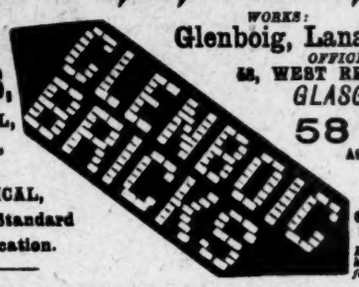

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLII., No. 2874.] TUESDAY, JUNE 11, 1918. [70TH YEAR.

EDITORIAL NOTES.

Lord Moulton's Call to the Gas Industry.

Of all Presidential Addresses ever heard in the gas industry, pre-eminently opportune is the one that the distinguished President—the Right Hon. Lord Moulton—delivered to the members of the Institution of Gas Engineers last Tuesday morning. "Classical" and "magnificent" are terms that were applied to it at the meeting. But the considered utterances of the noble occupant of the chair are something that will become historic; for it is a remarkable chain of reflections from a powerfully observant mind. Every sentence is a call to the gas industry to action; every sentence in turn is alive with warning, encouragement, or counsel. A greater service was never done the industry than when Lord Moulton was invited to accept, and did accept, the presidential chair of the Institution, for those acts have resulted in his address, which pointedly shows the administrators and the officials of the industry precisely where they and it stand, and what must be done if they desire to defend an industry of remarkable potentiality and service from the effects of internal inappreciation and external progress. We read into the address an accusation of lethargy and indifference to movements of past times. A *laissez faire* policy has allowed contemporary movements to make pace faster than the gas industry. Enterprise in attacking the fundamental obstacles to progress has been wanting. The industry has permitted itself to be chained to a rock of obsolete legislation without making strong and continuous efforts to be set free. There has always been within it a fear of something worse happening, instead of a feeling that the industry was (as it is) the possessor of a case of such strength that it must have eventually gained the better of those who would obstruct. Had the industry made positive and unceasing efforts to keep its statutory control and obligations abreast of the times, it would to-day have been in an altogether different and more absolute position to meet the changes which are being effected in other directions as well as to grasp the opportunities offered to it. Lord Moulton did not say all this with such blunt plainness. But his address went far enough to show that he realizes more than he said; and the truth of the matter is as we state it. To-day the gas industry knows this, and there is no room for excuse. The same listlessness (of it we spoke in our second editorial article last week) still abides largely in the industry. The great hope to-day is that the "guide, philoso-"pher, and friend" who has just been among us has spoken in a way that will have created a common resolve to work for change, advance, and the protection of an industry of such vital importance to the nation. He wishes the industry well; and in his final remarks at the second sitting, he pledged himself, if it were so wished, to do anything that is within his power to help the industry.

The address ought to be in the hands of every one of our legislators; it ought to be brought to the notice of every member of the Ministry of Reconstruction; and it ought to be read by every gas administrator in the country—though mere reading and study of it are devoid of that charm and emphasis which the author of such acute penetrative power and the possessor of such capacity for profound thought put into the delivery of the results of his examination of the industry's position—an examination the like of which has never yet been made by any man who has lived his years in more intimate association with the industry. We hope the Council of the Institution will see to it that the full value of the address is not lost by confinement within the industry. From it, our legislators may learn that laws governing industry should be subject to the mutations of our life and times; otherwise national and economic interests may be sadly and progressively sacrificed. From it, gas administrators may learn how past adhesion to ancient statutes has curbed service and rate of advancement. And by it, legislators, gas administrators, and the Ministry of Reconstruction would see that, in the national interests, in view of its products being essential to so much else contributing to national prosperity and convenience, the gas industry must no longer be chained to what is out of harmony with the times, but must be given its head. Everything, excepting ideas in regard to statutory control, has changed for the industry—even its commercial status in reference to competition; and in this respect the Government, while drawing from the gas industry products necessary to war, industry, and land cultivation, are proposing, or are being advised, to extend lavish assistance to the industry's competitors. The gas industry may go on, it seems, struggling with its position as best it can, simply because another industry, making use of its opportunities, has stirred up interest in a policy for the future, while the gas industry has no settled policy with which interest of any kind can be, or has been, stimulated.

"Your future," said the President, "will depend on how "serviceable you are to the public." That is a truth which should be posted up in the meeting room of gas administrators and gas officials throughout the kingdom. But if the President's apothegm be true to-day, it has also been true in the past. If this has been realized, then there has been an absurd attempt to attain an advanced place in serviceableness with the governing conditions entirely out of sympathy. For the purpose of supplying an illuminant, the gas industry was born; and statutory control and obligation were based on that one initial purpose. It is forty years since the incandescent burner came, and since the advent of the competition of electric lighting, during which period, too, domestic cooking and domestic and industrial heating, as well as power, have been making larger claim on gas suppliers. As he observed this, what must Lord Moulton have thought of an industry that has been struggling along under ancient legislation designed only for the supply of gas as an illuminant! Scientist, with a broad cognizance of technical affairs, he knows what this has meant in effect on both plant and operations; he knows how through it plant has had to be made and operated to fit statutory requirement, and not to meet in the most economical way the needs of the community. He also sees that, in order to comply with statutory obligation based upon an obsolete need, constituents are retained in gas that are badly wanted for other purposes. This does not conform to his notions of national economy. In such an industry, statutory control and obligation should be reconstructed on lines which not only take into account gas supply, but interests outside the gas industry which its methods of dealing with coal enable it to serve. From all points of view, therefore, in the highest of national interests, such legislation as that applying to the gas industry should, from time to time, be brought under review. That hitherto it has not been, shows a desertion of duty and responsibility on the part of both the Legislature and the gas industry.

His Lordship also warns the industry. Things are never going to be again for it as they have been. It is a new world into which it is going. It has much advantage on its side, in that coal must be carbonized for not only the production of gas but other necessaries; and it is the duty of the Government and the nation to see that industries which help to make the country self-supporting in both peace and war time are encouraged. This means national strength. Gas must be supplied of a character and of a

"reasonable" calorific power which will best serve heating purposes (which include incandescent lighting); and liquid products and ammonia must be developed to the utmost, and by the most economical of methods. To do all this, there must be research as well as more of that in the gas industry much-neglected scientific control. As Mr. Charles Carpenter, D.Sc., put it at the sitting on Wednesday, the industry must work to higher standards and to higher ideals. Supplemented by helpful legislation, everything depends on this, and upon the sense of responsibility that animates the men of the industry. To all this there is the strongest of incentives. The present position of the industry is not the measure of its position hereafter. If the recommendations of the recently-issued Departmental Committees' reports are adopted [upon this matter comment is made in our "Electricity Supply Memoranda" this week], the electricity industry will gain advantages with which the gas industry will not in like manner be invested. Further, fuel oils will be subject to active competition from abroad; and synthetic ammonia will be a product in this country with which the gas industry will have to reckon.

This is the position Lord Moulton dealt with eloquently, and so convincingly. He believes firmly in the gas industry; it is in the best possible position to deal with the fuel problem, and is of the highest national importance. He believes also in the men of the gas industry; they will realize the big task they have before them not only to make way, but to defend their position and their successes. He believes they will feel their full responsibility to themselves, to the industry, and to the country, and will adopt the best possible means of doing what is needed both in Parliament, on the works, and in raising the efficiency of gas use. Lord Moulton has nothing to gain from all this, other than the knowledge that, having been placed temporarily at the head of the gas profession, he has done his duty by speaking of what he has found, and by tendering advice accordingly. Then let not his beliefs and confidence be shown to have been misplaced. The whole of the address is a call—a call of brilliant note—to the performance of a specific duty. While there is one part of the work as set out in the address left untouched, the duty of those in responsible positions in the industry will be at fault. That it shall not be so, let the words of the counsellor sink well home: "The industry will maintain its high position in social and industrial usefulness if it realizes that the exceptional conditions under which it exists make it more, and not less, incumbent on it to keep to the front in the activity of its research, and its readiness to adopt the best means of performing its important duties. By so doing, it will not only render its future secure, but it will merit and win the gratitude of the country."

The New Fuel and Lighting Rationing Order.

WE are now in a position to give generally, but definitely so far as it goes, some information regarding the new rationing Order, which blends into one the control of the consumption of coal, gas, and electricity. This we are enabled to do through an interview which the Coal Controller (Sir Guy Calthrop, Bart.) has had, under the auspices of the Circle of Scientific, Technical, and Trade Journalists of the Institute of Journalists, with members of the Technical Press, at which interview he spoke plainly, and freely gave those present all explanations desired. The old Order dealing with gas and electricity, even the Coal Controller admits, was not a scientific instrument; but it must be remembered that it was instituted hastily to meet an emergency of a critical character. The preliminary point should be made that the course of events in connection with the war has caused a fuel rationing scheme to be a matter of absolute necessity; for this country has a duty to perform to its Allies as well as at home, and this despite the heavy draft that has been made on the miners for military service. It is not merely a question now of railway facilities, though these are an important factor in the position. Having said this much, we need say no more; and there is certainty on our part that "JOURNAL" readers will be content with the assurance of our satisfaction on the head of necessity. Hence, gas undertakings will be prepared to do their utmost to assist Sir Guy.

The fundamental object of the scheme (the Order relating to which is a formidable document applying, as from July 1, to the whole of the Kingdom, and will be issued almost immediately) is to save coal; and coal is at the base of the scheme. The method adopted for rationing is to fix a fuel value in tons. On this point memoranda prepared by the Controller state:

> It is not possible to secure any appreciable economy in consumption in the smallest houses. As the size of the house grows, the consumption of fuel has usually grown at a greater rate. This cannot now be permitted; and it may be observed that the scale will proceed on the even basis of 1 ton of fuel per room up to 20 tons, commencing with a minimum quantity of 3 or 4 or even 5 tons according to the climatic and other conditions prevailing in the district. For it is not thought feasible and right to enforce an identical scale upon all parts of the country. There must be a saving in fuel at all stages; but there must be a greater saving among the larger houses to make up for the less saving among the smaller houses. The enforced saving will amount to 50 p.ct. in numberless cases and even more. It is only fair that this point should be noted.

But the consumer has the choice of substituting 15,000 c.ft. of gas, or 800 units of electricity, for each ton of coal used short of the coal allowance. Conversion of fuel into gas or electricity may be, at the option of the consumer, by quarter tons, but by not less fractions. When the Order is issued, it will be found that there are allowances for lighting, according to the size of the house, in addition to fuel. It is known that there has been some effort made by members of the gas industry to get the equivalent gas per ton of coal raised above 15,000 c.ft.; and we think, looking at the matter from the points of view of the gas industry and national necessity, this might have been done. Of course the Coal Controller has also his point of view; and it is only right that consideration should be given to it.

In the first place, while recognizing the distinct national gain that there is in consuming gas and coke in place of coal, he has had to remember that all three of the industries—coal, gas, and electricity—have a right to live even during war time, and each has a right to just treatment. The figures for gas and electricity are not the exact equivalents of a ton of coal; but they are regarded by the Coal Controller as a "fair and proper compromise." The considerations, in arriving at this compromise, were: (1) The amount of gas or electricity required by a consumer to obtain the same effective service as the burning of a ton of raw coal; and (2) the amount of gas or electricity to be produced by the consumption of a ton of raw coal at the gas or electricity works. Of course, there is no correspondence between these two factors, especially in the case of electricity. In the result, we do not think that in one respect fairness has been done to the gas consumer for each ton of coal he gives up, seeing that of the ton half a ton of fuel is returned to the market in the shape of coke, besides the tar (with its constituents, which are of especial value to the country just now), and the ammonia. To deal with him absolutely fairly, as there is such a large *contra* account, he ought to have the gas production from at least 1½ tons of coal. In the case of electricity, the consumer will obtain 800 units of electricity per ton of coal, which anyone who knows anything about electricity generation is aware is absurd. It means that only 2·8 lbs. of coal are used per unit generated, whereas there are comparatively few generating sets that are showing such an efficiency as this—the average being something like 4 lbs. to 4½ lbs., and more perhaps now with the inferior coal being supplied. The equivalent should therefore be no more than 500 units. In other words, taking the average total destruction of coal, the electricity consumer is getting the electricity production of nearly 1¾ tons for his 1 ton of relinquished coal. On the other hand, we have the satisfaction of knowing that, through the greater efficiency of gas fires and cookers over coal appliances, and the wholly dissimilar conditions of use, the careful consumer can easily realize as much value from his new gas ration as from a ton of coal; and, in the interests of the gas industry, this is a point that should be impressed. He cannot do this with his 800 units of electricity, which is equal to rather less than 2¾ million B.Th.U., as compared with about 7½ million B.Th.U. for the 15,000 c.ft. of gas.

It has been pointed out in the foregoing that Sir Guy Calthrop is mindful of the distinct national gain in consuming gas and coke in place of coal; and he is reserving to himself the right in special cases to, as circumstances demand, raise or lower the gas ration per ton of coal. For example, for various reasons—munition works principally—it is not possible to manufacture sufficient gas in certain districts to meet the demands of consumers; and in these areas it will be necessary to reduce the quantity of gas allowed for each ton of fuel to a less figure than 15,000 c.ft. The minimum figure may be 12,000 c.ft.; and even this he

holds will give satisfactory service to the consumer. Similarly, in more fortunate districts, it may be desirable to stimulate the consumption of gas; and in these districts the allowance may be increased to a maximum of 18,000 c.ft. In Sir Guy's judgment, it is not possible to avoid this inequality; and, owing to the difficulty with transport to the South, the higher equivalents will (if allowed) apply chiefly to the North, and will compensate for the colder climate. But adjustments in these directions will only be made when experience of the working of the Order has shown them to be imperative.

Speaking of North and South, at the interview referred to, Sir Guy stated that stocks are again being built up in the works of the public utility concerns in the London area, although much slower than in 1917. But they cannot have anything like the amount required, nor can they expect to get as much coal in store as last year. A reduction of 1½ million tons has to be made somewhere. The Controller, however, has his eyes upon the paramount importance of doing the least possible injury to gas undertakings on account of the supplies required by the Ministry of Munitions, and to electricity works supplying power for munition purposes. In other parts of the country, the public utility undertakings will not suffer nearly as much, owing to better railway facilities—at least that is what Sir Guy says. In the household rationing, by the way, industries which do business in substitution for household work—such as bakeries and laundries—will be included. As to other industries, the rationing of industrial coal has also become necessary; and discrimination will be made as to essential and non-essential industries. In this connection, coke will be largely used to relieve the industrial fuel situation.

Preparations have been made to institute machinery to carry out the Order. This will be by District Committees, representative of the local community, gas and electricity concerns, and transport, with a leaven of independent members, and an executive officer who will be known as the Local Fuel Overseer. The Order is framed so as to enable the enforcement of measures against offenders. Where a householder offends in the matter of gas or electricity consumption, he will have his supplies of coal curtailed as an offset to his delinquency. In other words, excesses will mean prospective punishment self-inflicted. Obdurate and really indifferent offenders will find they have brought themselves within the four corners of the Defence of the Realm Act, and may have the gratification of paying a fine up to £100 or enjoy six months' imprisonment. In conclusion, let us say this, that the Coal Controller is very anxious to do what is right in the circumstances in which he is placed in respect of coal; and if any gas undertaking is hard-hit under this new scheme, the undertaking will find that Sir Guy will be most anxious to see whether a modification can be made in the position. With the 15,000 c.ft. gas ration, in our opinion he has something in hand.

National Kitchens and Commonsense.

THE British Commercial Gas Association have done the correct thing in taking up the question of the equipment of National Kitchens, and the attitude, or want of attitude, thereon of the Department responsible for this innovation. In these National Kitchens, Alderman Spencer has floated a really beneficent scheme for war time. But there the direction of his Department in the matter ends, notwithstanding that there exists a Government body dealing with the conservation of fuel, a Board of Fuel Research who are looking for the economical use of coal, a Ministry of Munitions who require materials for explosives, and an Admiralty who need fuel oil. None of these things can the electricity industry claim or supply; but either on the ground of a strict impartiality, or want of courage in assuring that the fuel used in the National Kitchens is the one that will serve the largest interests of the country, the Kitchen Department of the Food Controller permits electricity to be employed. It is the one reason or the other; or possibly the truth is that both reasons weigh. The fact, however, asserts its presence that, in the starting of the National Kitchens, great waste ensues by allowing local authorities to do as they please in the matter of equipment. Those authorities who have electricity supply concerns, and a large electrical influence permeating and controlling them, go in for electrical equipment, which is not an economic proceeding either in regard to national needs or in respect of capital, maintenance, labour, and running expenses. And for really efficient operation, the electric-ovens have to be supplemented by other means of boiling food and heating water. Such electrical equipment is up against everything for which the Government appeals—economy in money and fuel, and the supply of war requirements. Take fuel alone, on an average the country through, something like 4 lbs. to 4½ lbs. of coal are used per unit of electricity generated (3420 B.Th.U.); but the coal is completely destroyed. The same quantity of coal would produce at gas-works about 25 c.ft. of gas (approximately 12,500 B.Th.U.), and half its weight in coke, tar and tar products, ammonia, &c.

The work of the Kitchens Department, therefore, leaves off just where it might supplement benefits from the national standpoint; and that, to say the least, is bad policy. The electrical people know that they have a remarkably bad case for the all-electrically operated kitchen, and they know how much the electrical "unseen hand" has to do to keep things going; for, unlike gas appliances, the maintaining of electric cooking appliances in running order is a question for the expert, and low cost is a matter of specially low charge. There is a good deal of finesse clouding the actual facts of electric kitchen equipment and method; and some of the members of our local authorities have remarkably receptive ears where electricity is concerned. There is no doubt the electrical people are putting out all the influence they possess with a view to using any so-called "successes" in national kitchens as an advertising point for general electric cooking hereafter. This is not ordinary commercial competition. If it were, the gas industry would win every time. But the very fact that it is something other than commercial competition makes the position very difficult for gas people to deal with; and the only way to attack it is to rely on practical experience. Hence the value of the paper that Mr. H. H. Creasey read at the meeting of the British Commercial Gas Association yesterday week. We are sorry that the paper was not presented in more concentrated form. In these times of paper and labour difficulty, we cannot afford to look with the same benevolence upon spacious communications as in normal pre-war times. However as the paper has been printed in the "Bulletin" of the Association, and as it is going to be printed for general distribution by gas undertakings among their local authorities, the mere indication elsewhere in this issue of some of its points, without going into the interesting detail, must suffice. The reprint will better serve the intended purpose than reproduction in our columns. May we here suggest to the Association that, if the paper could be condensed, there would be greater likelihood of it being read by the busy members of local authorities, among whom it will carry several messages which the author and the Association will be fully prepared to substantiate.

National Gas Council and Coal.

One has only to consider the diversified lines of business that obtain in the gas industry owing to the varied character of its products to see what an immense field has to be covered by the National Gas Council in their negotiation and defensive operations. It is one of the curiosities of the industry that so many people and interests appear to be up against it, though so many people and interests require so much from it. It is partly because of this that we long since said, and others are beginning to appreciate the truth of it, that it is difficult to judge the success of the work of the National Gas Council, because the success is not to be measured alone by actual victories, but in addition (if this were possible) by the effect that their activities have had in preventing worse happenings. The report presented at the half-yearly meeting last Thursday, indicated the complex character of the work the Council has to take up. Coal, labour, priority, sulphuric acid, sulphate of ammonia, tar, and a score or more other subjects have been dealt with during the past six months. And there is much more work—and trouble—ahead; and the President (Mr. H. E. Jones) and the Chairman of the Executive Committee (Mr. D. Milne Watson) are fully alive to the fact that their positions are not by any means going to contribute to their ease of mind and comfort in the period that is before us. As one instance, the coal miners are already dissatisfied with their last 1s. 6d. per day increase (with 9d. for the boys), which resulted in 2s. 6d. more being put on the price of gas coal, with the surprise of a retrospective application, when there was no chance to retrieve it from the gas consumers. The miners want a repetition

of the dose; and what is going to result from this nobody knows. The matter will require careful watching. But it will be for the Council to urge that there shall not be a similar infliction of injustice. Meanwhile, the testimony from different parts of the country shows that coal stocks are in a very unsatisfactory position; and the Coal Controller, as will be seen by the editorial on the Fuel and Lighting Rationing Order, utters a caution that there is no possibility of getting for public utility undertakings, especially down South, the same dimensioned stocks this summer as last year. At the meeting of the National Gas Council, there were also suggestions as to the suspension of the Miners' Eight Hours' Act, in order that the men may get more coal per day. There is no need to do this. If the men would consent to do the right thing—work another day per week, or those who are at pits that are idle through the reduction of the export trade would only transfer their services to pits where men are needed—there would be no shortage of supply, provided the transport facilities were equal to its distribution, of which we have grave doubts. In the present condition of things, there ought not to be any increase of wages per day, unless the men give some *quid pro quo* in the shape of a longer day, or a bigger production per man per day.

Gas Washing and Tar Distillation.

There is one point in the report of the Executive Committee which is not exactly right, unless our information is defective. It states that an Order has now been issued, under the Defence of the Realm Regulations, imposing an obligation upon gas undertakings to carry out the orders of the Government in regard to the stripping of gas, notwithstanding their statutory obligations. What we understand to be the position is that, under the Act, a regulation has been issued making it lawful for the Admiralty, the Army Council, and the Ministry of Munitions to require gas manufacturers to do certain things, and protecting them from any resulting transgression of their statutory obligations. But we have no knowledge of the Admiralty, the Army Council, or the Ministry of Munitions having, since the issue of the new regulation, exercised the power with which they have been invested. As we have before said in the "Journal," it is a pity the three authorities do not issue a general order, under the new powers conferred on them, making it compulsory on the part of those who are oil-washing their gas to continue to so. It would be a protection to the undertakings against such proceedings as have been witnessed in the cases of the Portsea Island and Brighton Companies. Could not the National Gas Council move them to do this? One other matter. It is not surprising to find that the Council have not come to a definite arrangement with the tar distillers. It might be just as well, perhaps, to finally bring the long-drawn-out negotiations to an end, and begin to discuss a little more freely co-operative tar distilleries, or business arrangements in tar supply and distillation between the small undertakings and the large. There is very considerable feeling in the industry that the tar distillers are unwilling to give up their old freedom to do practically as they liked. The gas industry, however, cannot now afford the old position. It will be observed that the Council have not dropped the question of tar accumulations and dehydration; and they are trying to investigate the actual position in the country. Gas managers should assist the Council in every possible way in this matter; so that, if hardship is proved, the Ministry of Munitions may be again approached. According to statements made at the last Eastern Counties' Association meeting, difficulty is still being experienced by gas undertakings with the tar distillers.

The "Financial Hardships" Bills.

The second reading of the Gas Bills in Parliament has again been postponed—this time to the 17th inst. The reason is that Sir William Middlebrook and his colleagues are exercising considerable care in preparing the terms of their report; and the report must be submitted to members of the House before they can proceed with the formalities connected with the Bills. It is understood that Sir William submitted the draft report to his colleagues at their sitting last week; but there are certain other matters to be discussed which will necessitate a further conference of the Committee to-day (Tuesday). It is, however, expected the report will be available during this week. It is now generally known that the Committee will recommend temporary relief. There is, however, some idea abroad that the promoters are not going to get all for which they asked. At the same time the Committee intend that their proposals shall do better justice to the capital invested in gas undertakings than the terrible depreciation that has taken place in both dividends and values owing to the drastic impositions of the war. Those who have been working against justice being done will probably find in the terms of the report when it is issued ample condemnation of all their attempts to permit even modest justice being done. During the meetings of gas men in London this past week, there have been heard expressions of opinion which ought to have made certain ears tingle.

Decimal Coinage and Prepayment Meters.

The Decimal Coinage Bill which has been introduced in the House of Lords by Lord Southwark, in the name of the Associated Chambers of Commerce, has not received the support of the Government. But it is understood that they are willing to institute an inquiry into the whole subject. The idea is that a Committee of broad composition should be appointed to consider the question—the Committee including members of both Houses, and representatives of the Institute of Bankers, Chambers of Commerce, the Decimal Association, and a number of scientific societies. If the gas industry is not directly represented on the Committee, the National Gas Council must see to it that the views of the industry are properly placed before the Committee, in view of the large number of prepayment meters there are in existence, with their mechanisms adapted for pennies.

OBITUARY.

The death occurred, on April 27, at the age of 89, of Herr H. Salzenberg, who had retired some time since from the position of Manager of the Gas, Water, and Electricity Works of Bremen. In the course of his long life, he had repeatedly served on the Council of the German Association of Gas and Water Engineers.

The Lord Mayor of Belfast (Mr. J. Johnston), at a meeting of the City Council, made reference to the loss sustained by the death of Mr. James Murdock, Collector in the Gas Department. Mr. Murdock was in the service of the old Gas Company, before the undertaking was acquired by the Corporation, and was, therefore, one of the oldest officials.

PERSONAL.

The marriage took place at St. Martin's Church, Tipton, on Monday, the 3rd inst., of Nancy, younger daughter of Mr. William Prince, Gas Engineer to the Tipton Urban District Council, to Mr. W. Howard Wise, Assistant at the Tipton Gas-works, and son of Mr. W. H. H. Wise, of Sedgley.

Out of 34 applicants for the post of Engineer and Manager of the West Bromwich Corporation gas undertaking, rendered vacant by the removal of Mr. W. H. Johns to Sheffield, the Gas Committee selected seven to meet them; and the appointment has been given to Mr. J. W. Allin, the Manager of the Chorley (Lancs.) Corporation Gas-Works.

Mr. John Swan, after forty-two years' service, has resigned his position of Manager of the Ulverston Gas and Water Works. At the Urban District Council meeting last Tuesday, Councillor A. E. Sadler, the Chairman of the Gas and Water Committee, referred to Mr. Swan's loyal and faithful service, and (for the Committee) moved a resolution that Mr. Swan be appointed Consulting Gas and Water Engineer at a salary of £156 per annum. After remarks by the Chairman and other members of the Council, the resolution was unanimously approved.

Mr. E. J. Hutchence is the newly-appointed Resident Engineer at the Bow Common station of the Gas Light and Coke Company. Mr. Hutchence commenced his professional career with Messrs. Robert Dempster & Sons, of Elland. He joined the staff of the Imperial Continental Gas Association in 1889, and was severally connected with their works at Amsterdam, Berlin, and Hanover. He was at the last-named station, as Assistant Manager to Mr. Anderson, when the war broke out. On his return to England, Mr. Hutchence entered the Gas Light and Coke Company's service at Beckton, whence he was transferred last year to the Distribution Department at Goswell Road.

From the June issue of the "Co-Partners' Magazine of the Gas Light and Coke Company," we learn that the Directors at their meeting on May 10 accepted with regret the resignation of Mr. R. Birkett of his appointment as Resident Engineer at Bromley, and placed on record their appreciation of his long and loyal service. The Court have made the following appointments: Mr. J. H. Methven, the Resident Engineer at Kensal Green, is appointed Resident Engineer at Bromley, in succession to Mr. Birkett; Mr. A. A. N. Carpenter, the Resident Engineer at Bow Common, succeeds Mr. Methven at Kensal Green; Mr. E. J. Hutchence (as mentioned in the above paragraph) is appointed Resident Engineer at Bow Common; and Mr. H. Moys, Joint Senior Assistant Engineer at Beckton, is appointed Assistant to the Distributing Engineer in succession to Mr. Hutchence.

THE INSTITUTION OF GAS ENGINEERS.

PROCEEDINGS AT THE FIFTY-FIFTH ANNUAL MEETING,

HELD AT

THE INSTITUTION OF CIVIL ENGINEERS, LONDON,

JUNE 4 and 5, 1918.

President: The Right Hon. LORD MOULTON, K.C.B., F.R.S.

REVIEW OF THE PROCEEDINGS.

[For full Report see p. 482.]

AN overcast sky, with here and there faint patches of blue, domed London last Tuesday morning, as the members of the Institution assembled at the Institution of Civil Engineers for the first of the two sittings constituting the annual meeting this year. The approaches to the building gave promise of a full meeting; and by the time the President, the Right Hon. Lord Moulton, K.C.B., G.B.E., F.R.S., entered the large lecture theatre, the seats rising from the well of the place to the entrances were well filled. Lord Moulton was accompanied by Mr. Samuel Glover, the Senior Vice-President, who has done such excellent service during the year as his deputy when his Lordship could not occasionally attend to the duties of the office, with which duties, however, he has kept in close contact, and has personally performed a large part. With them was the Hon. Secretary (Mr. W. E. Price, of Hampton Wick) and the Secretary (Mr. Walter T. Dunn). Members of the Council were ranged to right and left of the President. Among the audience the Leeds University was represented by Prof. Arthur Smithells in khaki, and Prof. Cobb. On a front seat was the chief representative of the hosts of the Institution, Mr. Harry E. Jones, the President of the Institution of Civil Engineers; and hard by him was—in years octogenarian, but with skill, imagination, and practice as fertile as many years since—Mr. John West, to whom the Institution was doing well-merited honour.

Mr. John West Receives the Birmingham Medal.

Lord Moulton took the chair with hearty welcome from those facing him, who recognized how much his Lordship had honoured the Institution by the acceptance of the presidency. What was then thought paled before what was thought after the close of the Presidential Address which was to be shortly heard. Members quickly found that his Lordship's legal and scientific attainments are not the sum and substance of his qualifications for the presidency of a technical organization. He has business capacity, and has no room in the conduct of the proceedings of technical and business men for waste time. Without ado, he submitted the minutes of the last meeting, and had them taken as read. The Scrutineers were appointed, and sent to their not over-agreeable task when so much which they wished to hear was coming forward. Mr. J. W. Auchterlonie and Mr. R. W. Edwards were the selected ones; and we sympathize with them. Mr. John West was at once invited to the President's side. The cheers which accompanied to the place the veteran gas worker and benefactor of the industry were in themselves a volume of testimony, of praise, and appreciation of worth, and of ratification of the choice of the Council. What greater reward could a professional man have than such spontaneous acclamation from his fellows on such an occasion? By all the conditions attaching to the Birmingham Medal, never has a recipient been more, though maybe equally, worthy of it for real solid, practical work that has brought economy and efficiency to the productive side of the industry. To receive the medal from the hands of Lord Moulton, accompanied by those eloquent expressions which are not the property alone of rhetoric but are shared by mind, is itself an honour which will always be associated by Mr. West with the medal and the occasion. It was one man of great worth in high spheres speaking to another man of great worth in a highly practical sphere of life; and the choice periods had the full ring of sincerity about them. They were listened to by recipient and audience with hushed interest; but at their end came the confirmation in striking notes from all parts of the lecture theatre. The pride that was in Mr. West at this recognition from his fellows of the professional organization found earnest expression. But though he mentioned his eighty years of life, there is no voluntary intention of giving up yet. The medal, he says, will be "a stimulus for the future!" There were cries of "Bravo." And with characteristic humour, he set his numerous friends off again, when he said he hoped "the old dog had not done yet." So we all hope. But however long the service may be continued, the list of the recipients of the Birmingham Medal will stand in history, and the one added in 1918 will stand for solid merit.

The President's Address.

Much was expected from the President in the shape of an address; and knowing Lord Moulton so well, the expectation was safely founded. It was a very remarkable deliverance to which the members listened. It commenced modestly; but soon those present were carried away with its depth of thought, and for the time for each individual present there was only one other man and one voice. All else was forgotten. Every sentence was a work of the intellect; and the whole address was one long trumpet call to the professional men of the industry to recognize their responsibility to themselves, to the industry, to the nation, and to work for the realization of the potentialities which the process of coal carbonization offers. "I have," said Lord Moulton, referring to his past four years' experience, "learnt as well the flexibility and resourcefulness of the

industry as the importance to the nation that all its varied capacities should have free scope." The gas industry and its work are by no means new things to his Lordship. By various channels he has kept in touch with them. But his more intimate association in recent times has caused him to reflect, and the address gives the fruit of his reflections. It took us back to the modest beginnings of the industry, and to its single aim—illumination; and therefrom there was a continuity of thought and examination. While the use of gas for lighting has been the backbone of the industry, the fact has not been an unmixed blessing. The industry has always been tied in its statutory regulation and obligations to that original and dominating single purpose. It has had in one sense a reflex action in that all the progress effected in plant and practice has "necessarily had to be made in strict conformity with the statutory duties; and these duties were based on the behaviour of gas as an illuminant." Had it not been for the delimitation imposed by statute, and the custom of regarding gas as an agent with more or less a single purpose, progress would no doubt have been greatly accentuated. But there came a stage in the history of gas supply when the industry missed a chance (as it has often shown a wonderful capacity for doing) for obtaining relief from the trammelling restrictions under which it has been struggling to work. This stage was the almost simultaneous introduction of the incandescent gas-burner and public electric lighting; and the accompanying conditions so thoroughly changed "the industrial position of the gas industry as to justify, and even to demand, a complete review of the statutory obligations imposed upon it." But more as to this anon.

Destructive Distillation a Constructive Process.

Evermore we shall not in the gas industry be so fond of the use of the term "destructive distillation." It is one that jars upon the ear of Lord Moulton; for to him the so-called "destructive distillation" is one of the most constructive processes of which he knows. And here, in a manner that no less a master of science and thought could do, he carried the gas makers present away to view the results of their carbonizing work in a new light. These results will never again be the same to them as of yore. Never has even the chemist pictured the work of carbonization in like manner. Though the carbonizing operations destroy the crushed remains of past organic life which constitute coal, in their place appear new and definite combinations, which, taken individually, or regarded as a series, represent no longer the *débris* of a past world, but the building materials of a new one. And as we followed the President in his review of the changes in material that take place during carbonization, and which result in varied formations and combinations, altering vastly with moderate variations of conditions, we realize how little that is stable is known of the actions and the reactions that occur within the retort. "Hence it is the gas industry owes so little to the laboratory, and so much to industrial practice and the results attained therein." During the past four years, many carbonizing innnovations have been placed before the President, from which he has been "led" to expect great things. Knowing the President, we think the word "led" is a slip, and should have been "asked." But it says something for the good foundation of the older practices to learn that the results of the innovations have been inferior to those from them. "The successful methods still remain those which practical experience has discovered, and which were adopted with no intention of producing these special results."

More Freedom under Legislative Control.

To revert to the restricting influence on progress of legislative control when the control is fundamentally established on something that is obsolete. The President fails to see any means of completely uniting legislative freedom with necessary legislative control—necessary because of the grant of very special powers to gas undertakings. But however skilfully devised statutory regulations may be, they suffer the disadvantage that they are determined by, and intended to fit, the industrial and economic conditions of the people at the time they are made. The whole argument which succeeded showed how essential it is that from time to time the statutory requirements put upon gas undertakings should be reviewed so as to ascertain whether they still correspond in the best way to the wants of the world outside. To this question of public policy, a foremost place must be given in view of its magnitude. The Legislature ought therefore to be prepared to ask itself whether the interests of the people remain the same as they were when the existing statutory obligations were imposed upon gas companies, and whether, if they have changed, these obligations cannot be modified to the general advantage. The answer to the first question is found in the fact that the public no longer need a gaseous illuminant; and those substances which gave to gas its luminosity can now be used in a more profitable way, which, of course, opens up new work for the gas industry. "That a large portion of these valuable substances should be sacrificed to give to coal gas a property which has ceased to be of value is a loss to the community which should not be allowed to continue." It is to be hoped that Lord Moulton's words will penetrate to the legislative chambers at Westminster, and that his considered judgment as to a "reasonable" calorific standard being established will be adopted—a standard so "reasonable" that it can be uniformly established throughout the kingdom, and that without delay. "This would put gas and its great rival electricity on an even footing in one important respect. Each will be paid in proportion to the amount of energy supplied to the consumer in the one case in the form of thermal units, and in the other case in the form of electrical units." In the President's opinion, it is an industrial mistake to aim at making either displace the other. But "each must be free to do its work in the best way it can, using all the advantages it possesses both in respect of production and consumption, unhampered by needless or harmful restrictions." Let this, too, be marked: "All this is already true in the case of electricity, but it is not true in the case of gas; and in the future that awaits gas companies, it is clear that they will need all the liberty of action that is consistent with their real service to the public to enable them to hold their place in the new industrial conditions in which they will be placed."

The Characteristics of the Future.

How well the President concentrated thought upon the position of the industry travelling from the past to the present and then peeping into the future is further seen by what directly follows. The future for the industry will differ widely from past times. The capacities of electricity for concentrated production and wide distribution have been demonstrated; but the President was far from representing that all electrical schemes that have been propounded will be adopted in the near future, or that in their entirety they will ever materialize. The primary necessities of civilization for our great town populations must be secured by being made to rest on bases so broad that they are safe from sudden disturbance. This is a basic essential. Centralization has its drawbacks as well as its advantages. But the President predicts that electrical distribution will receive support from public funds, and will certainly be assisted by largely extended statutory powers. "Thus favoured"—mark this!—electricity will be in a position to offer a fiercer competition with gas undertakings; and this furnishes to Lord Moulton's mind a strong justification for a revision of statutory obligations. But as a set-off, there is the growing appreciation of the value-in-use of the bye-products of gas manufacture—particularly fuel oils and the aromatic series of hydrocarbons (which are the foundation of the chemical industries), as well as ammonia. The war has shown the existence of a world shortage of food under the old conditions of cultivation. In the production of ammonia, therefore, the President sees the greatest room for advance. Research, however, may raise up new competition, and demand may call into operation foreign sources of supply—for example, synthetic nitrogen produced at home, and the importing of suitable fuel oils from countries that produce petroleum. But such competition will not lessen the production of ammonia at home, for it is a bye-product too valuable to lose. And the same may be said to a certain extent of the other bye-products affected. Here we have another philosophic point which it would be well if our legislators would read, mark, learn, and inwardly digest. "We have," said Lord Moulton, "learnt by sad experience how costly it is to allow the country to neglect the development of its own internal resources merely because it could get its wants supplied cheaper or more easily

by purchase from abroad. To do so with regard to munitions of war would be madness, as the supply would be endangered at the moment when it was most urgently required. But the same may be said of some things which are munitions of peace—things essential to the life of a nation at all times, in peace and war alike." And in the same train of wise thought we find this: "If we neglect to make the most of our internal resources, the long-continued waste of these resources gets embodied in our plant, in our methods of manufacture, and in our industrial organization, and when the time of trial comes, it may be impossible to eradicate it. The development of its own internal resources has a value to the nation not measured by the immediate economical returns."

Future of the Industry Depends on its Men.

Then the President gave gas undertakings encouragement in connection with fuel supplies. When put under proper statutory regulations, they will be able to make gas to the best advantage; and they are already in possession of the best market in which to dispose of it. The regularity of the demand and the conditions of production place them in an excellent position to control the nature of their bye-products so as to get the most economic return. And then advice—perhaps indirectly expressed: "To do all this so satisfactorily as to face the competition that will arise in the more energetic industrial world that we hope to see develop after the war, will require an equal energy on their part—an equal readiness to improve their methods where found imperfect." Where research leads to clear and definite results, gas men must be ready to adopt them. And research must not be confined to production; it is equally important to develop the utilization of gas. Between the two, Lord Moulton fears, there has been too great a severance. In all our doings, let this phrase be ever prominently present in mind: "Your future depends on how serviceable you are to the public." We draw near the end of the address, and there the incalculable value of the industry to the country is spoken of. This will continue to be recognized, and the industry will maintain its high position in social and industrial usefulness "if it realizes that the exceptional conditions under which it exists make it more and not less incumbent on it to keep to the front in the activity of its research and its readiness to adopt the best means of performing its important duties. By so doing, it will not only render its future secure, but it will merit and win the gratitude of the country."

Appreciation.

These were the words last uttered in an address opportune alike in the breadth of its observation, its wisdom, its warning, and its advice. It will be the fault of the industry if the advice does not bear fruit. The deliverance was described by Mr. H. E. Jones as a classical one, in which was propounded for the industry its future policy. This was in proposing a vote of thanks to the President; and Mr. Jones took the opportunity of urging gas undertakings of all descriptions to contribute to the technical work of the Institution—as do the gas undertakings in France in the case of the Société Technique du Gaz. When Mr. A. E. Broadberry had seconded the motion, it was passed with acclamation. In his acknowledgment, there was one point made by Lord Moulton which should be strongly emphasized. He wants the responsible men of the industry to feel that the very security of the position of their undertakings as statutory establishments, their status and their sphere of action, are no excuse for them being less active than others in pressing forward.

Increased Subscriptions.

To speedily pass from such an address to humdrum business was not quite to the liking of anyone present. There had been some rumour as to the likelihood of opposition to the proposal to raise the subscription of the members to two guineas, and that of associate members to one-and-a-half guineas. But who could object to these increases when the mind had been riveted on matters that mean so much to the industry? It would have been a descent from the sublime to the ridiculous. There were many who did not vote for the increases; but there was not a hand held up against them. So the Institution is to realize a larger revenue in future; and a larger revenue should mean more useful work.

Report and Accounts.

The same with the report and accounts, the adoption of which was moved by the President, and seconded by Mr. C. E. Jones. The members generally found nothing which called for remark. But Mr. George Helps made an inquiry and a suggestion. The first was as to whether the Government wanted tar oils from horizontal retorts as well as from vertical retorts. The one and only answer was given by Mr. Samuel Glover, that Sir Arthur Churchman wants everyone, irrespective of the method of carbonization, to produce as much fuel oil as possible. The suggestion by Mr. Helps was that the Institution ought not to let Mr. Thomas Settle be outside its doors. He did great work in connection with vertical retorts in the early days; and Mr. Helps considered that he should be brought into the Institution as an honorary member. To his suggestion, Mr. Glover promised the Council's consideration.

This concluded the morning sitting; but for some time the members continued loitering in groups in the precincts of the lecture theatre, discussing the President's address, in regard to which there was only one note—that of intense admiration for the breadth of thought which it incorporated.

Benevolent Fund.

Next morning this deserving fund received attention, when it was seen from the general report that the Committee of Management have had to work very close to a limited income; and that, had it not been for certain welcome donations, there would have been a deficit of upwards of £70. Claims continue to come in; and again there is an earnest appeal for the help of those who do not yet contribute to this beneficent branch of the work of the Institution. There came from the President the announcement that Mr. John West had generously sent a donation of £100 to the Benevolent Fund, and that it had been decided to place in to capital account—a very wise proceeding.

Refractory Materials Research.

The only Committee who presented a set report for special presentation to the meeting (apart from the general report of the Council) was the one dealing with refractory materials research; and their report was accompanied by an Appendix treating of the "Effect of Load on the Refractoriness of Fire-Bricks, &c.," by Dr. J. W. Mellor and Mr. W. Emery. Both the report and appendix are given *in extenso* elsewhere. The war has, of course, interfered considerably with progress; but, as Mr. J. P. Leather later stated, the work has been largely in the nature of putting in the foundations. So long as the foundations are well and truly laid, there can be, in the circumstances, no objection to the delay, with work of such importance. The report was presented by the Chairman of the Committee, Dr. Harold G. Colman; and it was in his opening remarks that there was heard the disappointment of expectations. There has, for instance, been inability to obtain a second assistant to Dr. Mellor. Qualified assistants are not to be picked up anywhere and at any time, and more especially just now. But it is expected that the result of the additional research will shortly be ready, and then this will be published in the "Transactions" for the year. Dr. Colman passed on to consider the report by Dr. Mellor and Mr. Emery on refractoriness of fire-bricks under load; and the results are well summed up in this statement: Fire-bricks under load seem to break down in one of two ways. In one type of collapse—fusion collapse—the fire-bricks gradually give way as the temperature rises, until finally the piece collapses. This behaviour is typical of aluminous and zirconia bricks. The breaking-down temperature indicated in the tables is not a definite temperature, but rather an arbitrary range of temperature during which the brick has sunk (say) ½ in. In the second type of collapse—mechanical collapse—the fire-brick may show symptoms of a gradual deformation; but the

characteristic feature is a more or less abrupt collapse. This is typical of silica and siliceous bricks, and, to a less degree, of magnesite and chromite bricks, although a sufficient number of varieties of the latter have not been determined to give the same confidence in making general statements. The Committee, as Dr. Colman maintained, have acted wisely in not putting in the results of tests under load without further investigation of fire-bricks which have proved to be most successful in retort-settings but give a very bad test under load, and would on the results of such tests alone be rejected. The manner in which pressure acts on a brick is, said Dr. Colman, at least of equal importance as the magnitude of pressure; and the devising of a test which would enable a brick to be tested under pressure in the same way as in a setting may prove to be a very difficult matter. Dr. Colman also mentioned that a considerable amount of work has been done on the disintegration of fire-bricks by sand blast, and on the action of flue dust on refractory material. He also mentioned that, after much difficulty, the furnace required for testing the effect of variable atmosphere on refractoriness has been got into working order.

Points from the Discussion.

Quite a well-sustained discussion followed the report; but unfortunately it was one of those discussions in which most of the speakers roamed somewhat away from the definite subjects. As a matter of fact, the President was the only one who got into real close contact with them, as will be seen in the full report. But there was one thing that most of the speakers emphasized; and it was that the question of refractory materials is so complex that it requires the very best possible work put into it. The point was made by Mr. Alex. Wilson in seconding the report; and there was like recognition by Mr. Leather, who also made several useful hints. It is found by the test of practical experience that British manufacturers are making greater use of scientific control than before this investigation commenced; and this was acknowledged by both Mr. Leather and Mr. Charles Carpenter, D.Sc. The former, however, pointed to the responsibility of gas engineers in so designing their retort-settings as to make the best use of the materials they use—in, among other ways, avoiding the coincidence of high pressure and high temperature. Fire-bricks, like other things, require proper treatment. He and Mr. Samuel Glover referred to the subject of cast retorts; and there is an opportunity for a number of members who use standard-sized retorts to help the Committee by testing the cast type under working conditions. That the manufacturers are keenly alive to the importance of adopting scientific courses was seen by the contribution made to the discussion by Mr. Albert Cliff, the Chairman of the Fireclay Goods Section of the Society of British Industries. The effect of salt in coal upon bricks was raised by Mr. W. Chaney; and from his experience with coke-ovens at Birmingham, he has been filled with doubt as to the contention that the brick which contains the largest amount of silica is the most effective for work requiring high refractoriness. Bricks that contain 95 to 98 p.ct. of free silica have not stood so well as bricks containing (say) 75 p.ct. The only explanation he can give is that bricks containing the highest percentage of silica are very porous, and so give the salt scope for carrying its evil influence well into the material. For years, Mr. Charles Carpenter has been preaching the gospel of scientific control in all the operations and processes in which the gas industry engage; and he asked permission to use the report for dwelling upon this matter, for it is the real and necessary accompaniment of the warning and advice tendered by Lord Moulton in his Presidential Address, and which address Mr. Carpenter described as magnificent. Everything the gas engineer touches must be dealt with scientifically in the future; and the industry must, if it wishes to maintain its position in the coming great struggle, have higher standards and higher ideals. Years ago, when Mr. Bywater first raised this question of refractory materials in the gas industry, it will be remembered Mr. Carpenter boldly declared that the German makers turned out superior retorts to the British; but he just as candidly acknowledges that it is now possible to make British retorts which have as good a chance of being the equal of German ones—whether they will be better he cannot at present say. It is something gained to be able to get retorts of quality equal to the German ones. Lord Moulton fastened upon the reference made in the preceding paragraph to the results of the report by Dr. Mellor and Mr. Emery, and he finds that what is stated there brings forcibly to mind the double nature of the question of refractory materials. In reading reports of this character, he urges the importance of always attempting to get into sympathy with the nature of the problem dealt with; for then one appreciates better the real value of the work. It was learned from Dr. Colman's reply that the question of the effect of salt has been for six years past upon the list of subjects for investigation by the Committee; but the limit of their capacity is very low for getting work done now.

A Special Meeting to be Called.

That gas engineers are appreciating that the interest that is being taken in high places in the reconstruction of the electricity industry is a matter of profound importance to the gas industry was reflected in a couple of questions put by Mr. H. Kendrick. From these it seems that many members are anxious to know the results of the experiments made by the Gas Investigation Committee; and there is also the question of presenting to the Reconstruction Committee the case of the gas industry as to the conservation of coal. The case of the gas industry ought to be much better than any destructive criticism would be that might be levelled against the reports issued by the Departmental Committees on Electric Supply. From the information supplied by Mr. Samuel Glover, it was heard that the Council intend shortly to call a special meeting of the members to consider the first report on the composition of gas; and, in all likelihood, a report which is being prepared from the gas industry's point of view on the conservation of coal will be submitted on the same occasion.

Coming Presidents.

For all he has done during his two years' holding of office as Senior Vice-President, and for his work as "right-hand man" to Lord Moulton during the past year, Mr. Samuel Glover richly deserves the distinction that the presidency of the Institution confers. He is its President to-day; and the further announcement of Lord Moulton showed that we shall have, all going as will be desired, as successors to Mr. Glover in the chair, two Presidents bearing the Christian name of Thomas—Mr. Thomas Goulden, the Chief Engineer of the Gas Light and Coke Company, and Mr. Thomas Hardie, of Newcastle-on-Tyne.

Our Allies.

Fraternal messages that have passed between the President of the Société Technique and Lord Moulton were read by the latter; and there was much enthusiasm in learning that, in addition to the President of the French Society, the Presidents of the kindred chief organizations of Italy and America are to have their names added to the roll of honorary members of the Institution.

The Closing Business.

It was there and then decided to meet in London again next year. Succeeding this, all who deserved thanks in connection with the work of the Institution, were remembered in heartily carried votes—all but Mr. Dunn; and this was an unpardonable oversight on the part of someone. But there are one or two points more to be noticed; and they occur in the rep'y of Lord Moulton to the vote of thanks to himself, for he has been a President *par excellence*. He has promised that, if there is any duty or service he can perform for the gas industry that is within his power, he will do it. His concluding words were ones of advice. The best way to make advances yourself, he said, is by making advances. To rest where you are is equivalent to falling back. "Interest must be taken in everything applying to its work if the industry is to be made more efficient. You want to win not only economic success, but you want for your industry the appreciation of the whole country. I am sure you are determined to obtain that; and you have my best wishes." It is for the gas profession to live up to this determination; and to show Lord Moulton that his counsel has not been uttered in vain.

THE INSTITUTION OF GAS ENGINEERS.

MEETING TUESDAY, JUNE 4.

PRESIDENTIAL ADDRESS DELIVERED BY

The Right Hon. LORD MOULTON, K.C.B., F.R.S.

I am fully conscious of the exceptional character of the honour done to me by the Institution in choosing me for its President for the past year. It is true that my acquaintance with the gas industry is of old standing. From outside I have followed somewhat closely its progress for many years; and there are few of the steps which have marked its growth with which I have not been made familiar at the time through one channel or another. But it is not such qualifications as these that win the distinction you have conferred upon me. You have hitherto selected your President from within your own ranks—from those among your members who have been pre-eminent in the practical working of the industry—from those who have been the inspiring spirits of the developments which it has undergone, or who have borne the burden and responsibility of managing the works from which the public derives its supply. I can claim no merits of this type. That I am in this position is due to no contributions on my part to the theoretical or practical advance of gas manufacture, but to the fact that perhaps best of all men I can appreciate how great has been your success.

No one has had such a unique opportunity of witnessing the response of the industry to new and exceptional demands made upon it by reason of the war. Your industry—typically peaceful in character and aims—has furnished material for purely war purposes without which it would have been impossible to maintain the fight. I have thus learnt, as well the flexibility and resourcefulness of the industry, as the importance to the nation that all its varied capacities should have free scope. Not only have the benzol, toluol, and ammonia produced by it furnished the materials for our high explosives, but in the direction of other needs of very different nature it has given promise of similar usefulness. I have thus been brought to reflect on its capacities of service to the public in war as well as in peace; and as I am here, not as one who has himself done anything to advance the industry, but as one who has had occasion to judge and to testify to its capabilities and its successes, I think that I can best utilize this occasion by giving you the fruit of these reflections.

Artificial Illuminants.

I have styled your industry as pre-eminently peaceful in character and aims; and I have no doubt that such a description will be approved by you. It started little more than a century ago, with the single object of giving locally a public supply of a new illuminant. This must have been sorely needed. Up to that date the only illuminants were oils, fats, and waxes; and considering that mineral oils were not used to any practical extent, if indeed at all, it is difficult to understand how the supplies of these illuminants could have sufficed for even the barest necessities of the world in respect of artificial light. Had our huge town populations or our present habits of life then existed, these supplies must have wholly failed to meet the demand. But smaller populations, earlier hours, and, I may add, a less lavish use of soap, made it possible in those times to make both ends meet. It is certain, however, that this could not have been effected had not our ancestors been content with a much smaller intensity of artificial light than would satisfy their descendants of the present day who have been spoiled by the wealth of light obtainable from the unlimited supplies of gas, electricity, and mineral oils which are within their reach.

The Advent of Gas.

We owe much to the imagination and daring of the men like Lebon, Murdoch, and Winser, who first conceived and sought to put in practice the idea of supplying an inflammable gas as an illuminant. The process they used was not new—it was the same that had been employed in the manufacture of coke for at least half-a-century, and which was known to yield inflammable gas, although this was considered of so little value that it was burnt as a waste product. But the conception of conserving this gas and distributing it to the public for illuminating purposes was a bold one, and had hardly received the recognition it deserves. It would not be unnatural that a man should shrink from a proposal to distribute broadcast through the streets and houses of a town a gas known to be poisonous and inflammable, carrying with it therefore the risks of death by poisoning, fire, and explosion. It is a matter of surprise to me that such a daring project won acceptance so rapidly; and it raises my opinion of the enterprise and initiative of the men of that time. The first application for statutory powers for public gas lighting was made in 1809; and after one failure, the application was repeated successfully in 1810—a record which compares favourably with my recollections of the attempts to introduce public electric lighting some seventy years later. The rapidity with which the movement spread indicates at once the need that existed, and the adequacy of the remedy. Within twenty years of this first attempt, some 200 public gas companies existed in the kingdom, and by the middle of the century all urban populations must have been supplied with gas.

During all this period, and for many years afterwards, the position of coal gas in the eyes both of the public and the Legislature was purely that of an illuminant. No doubt from the first the possibility of its use as a heating agent was recognized and utilized on a substantial scale in gas-stoves, and more especially in cooking apparatus. But it made comparatively little progress in supplanting the domestic coal-fire. Even to the present day it is in this direction that, to my mind, its advances have been the slowest and the least representative of its real capabilities. Be this as it may, the fact remains that during the whole of this period its main function was that for which it was originally started; and the standard of its duties was rigidly based on this. Great changes were introduced in the practice of gas manufacture, due on the one hand to the introduction of the rival modes of producing inflammable gas known respectively as producer gas and water gas, and, on the other, to the appearance in the market in well-nigh unlimited quantities of mineral oils, which served both as rivals and helpers of the coal-gas industry. But these changes in practice were necessarily made in strict conformity with the statutory duties; and these duties were based upon its behaviour as an illuminant. This remained its purpose and the test of its success. Nothing occurred in the external world of such a nature and of such importance as to alter its general status and aims until about the year 1884, when the introduction of the incandescent mantle on the one hand, and of public electric lighting on the other, so completely changed the industrial position of the gas industry as to justify, and even to demand, a complete review of the statutory obligations imposed upon it.

Destructive Distillation.

Fundamentally, the gas industry rests upon the use of a single process usually termed destructive distillation—a name which no doubt is apt to describe it, but one which always jars on my ear, for to me the so-called destructive distillation is one of the most constructive processes that I know of. It is true that it destroys the crushed remains of past organic life which constitute coal, so that they lose all traces of their past identity. But in their place appear new and definite combinations which correspond in no sense to these past embodiments, even though in some unknown way they may have been influenced, or even determined, by them. These new combinations, whether taken individually or regarded as a series, represent no longer the *débris* of a past world but the building materials of a new one. They show us the early steps through which Nature builds-up its most complex work. Man has analyzed much of what Nature has done in the organic world, even going so far as to divine the structure of some of the bodies essential to support life. He has even succeeded in imitating some parts of this work by synthesis. But I think

that a chemist would agree with me that in this field the points of departure have been found, and in future probably will be found, in some one or more of the many compounds thus yielded by this creative process of destructive distillation, and which the chemist and engineer can, when needful, separate from the crowd of their companions which are formed along with them.

How are these definite and distinct compounds formed? They are evidently the production of chance encounters of the elements which are present under all sorts of forms, and which are brought into intimate contact with one another under all sorts of conditions and in all sorts of sequences. Destructive distillation is the most striking example of the difference between a laboratory process, where uniformity of conditions can usually be attained, and an industrial process where it is unattainable. The compounds immediately formed in a gas-retort when heated vary no doubt by reason of the circumstances which regulate the temperatures to which they are first exposed. But their formation is only the first page of their total history. They meet under varying local conditions other compounds of varied character; and the changes that take place may give rise to stable bodies which survive, or to intermediate formations which will in their turn pass into other and more stable combinations before they have run the gauntlet of the total process. Small varieties of local conditions may determine which of these types of action will prevail. It is impossible to predicate or foretell with precision the course of such a conflict of forces. Hence it is that the gas industry owes so little to the laboratory and so much to industrial practice and the results attained therein.

In the last four years I have again and again had to learn by sad experience how little one is able to foresee or control the results of destructive distillation, even in the simpler cases, where it is applied to hydrocarbon liquids, where it is possible to get some approach to uniformity of conditions. How many times have I been promised priceless benzol and toluol by the use of some special method of carbonization, or of some new system of cracking oils; and how inevitably has failure attended the practical tests? Innovations from which I had been led to expect great things have given results inferior to those given by old-established practice. The successful methods still remain those which practical experience has discovered, and which were adopted with no intention of producing those special results. I have often felt ready to imitate the cynical expression of despair which that great judge, Sir George Jessel, once used when speaking to me of the bad acoustic properties of Courts. "If you want to build a room for a special purpose," said he, "be careful to conceal that purpose from the architect. The only Court in Lincoln's Inn where you could hear well was built for a Library, where strict silence was to be enforced."

But if it be true that the *modus operandi* of destructive distillation is little known, it is none the less the fact that the accumulation of practical experience on a gigantic scale during more than a century has enabled gas engineers to arrange their methods and choose the form and arrangement of their plant so as to make the final result vary to some extent in the direction which they desire. It is therefore of the first importance that they should be free to adjust their production so as best to meet the real needs of the community. It is not an easy task to arrange for such freedom. Legislative control of a stringent kind must exist. The distribution of gas necessitates the grant to the companies of very special powers, such as the breaking-up of streets, the possession of which is admitted to bring with it an absolute monopoly in practice if not in theory. No company can be put in such a position unless it is willing to accept such Legislative control as will define the services which it must be prepared to render to the public in return for these privileges and will secure the performance of the duties so imposed upon it. Unfortunately, this rigid definition of its duties necessarily stereotypes its works and its aims. However skilfully devised these statutory regulations may be, they suffer under the disadvantage that they were determined by, and intended to fit, the industrial and economic conditions of the people at the time they were made. Such conditions change from day to day, and, in a progressive civilization like ours, may be fundamentally altered in the space of a few years.

In the case of private industrial organizations unfettered by Statute, self-interest operates so strongly as to lead them at all times to provide as economically as possible that for which there is a demand—*i.e.*, that which best suits the needs of the people at the moment, inasmuch as their success depends on it. Hence we are content in ordinary cases to rely on this; and we should feel instinctively that producer and consumer would alike suffer from any extraneous interference with the natural response of supply to demand. We recognize that interference from without has a tendency to destroy the connection between efficiency and success, and to perpetuate what should have passed away as obsolete. But we are too apt to forget that the same principle must apply to cases where, for special reasons, such interference is necessary, as in the case of gas companies. The necessity of doing something does not lessen the price which has to be paid for it, or free us from the penalty if it is wrongly done.

Reviewing Statutory Requirements.

It is therefore essential that from time to time the statutory requirements upon gas companies should be reviewed to ascertain whether they still correspond in the best way to the wants of the world outside. And to this question of public policy a foremost place must be given in view of its magnitude. At least one-tenth of the whole of the coal raised in our country is taken by gas-works; and we cannot afford to allow so large an amount of our fuel supply to be unwisely used. The Legislature ought, therefore, to be prepared to ask itself the question whether the interests of the people remain the same as they were when the existing statutory obligations were imposed upon gas companies, and whether, if they have changed, these obligations cannot be modified to the general advantage. Only one answer can be given to the first of these questions. The public no longer need gaseous illuminants. The success of the gas-mantle, which depends on the calorific value and not on the illuminating power of the gas, has decisively settled this question. Provided that the gas will give out the requisite heat to raise the mantle to its proper incandescence, it will enable it to give out from six to eight times the illumination that the statutable gas used to give in ordinary use. It is therefore immaterial whether the gas possesses illuminating power or not.

Abolition of Illumination Standards.

Now the illuminating power of coal gas is obtained by burning along with the permanent gases which form so large a part of it other denser and more complex substances which are separable from those permanent gases, and which, as a rule, are capable of independent industrial use for various purposes. I will not pause here to dwell upon these uses. They will suggest themselves to all of you. Some of these substances are capable of being used as fuel in other and more advantageous ways. But it is not only as fuels which could be better used in other ways that we regret the substances which are left in coal gas in order to make it an illuminant. The invaluable hydrocarbons on which our chemical manufactures depend—which give us our dyes and our high explosives—are to be found among them. That a large portion of these valuable substances should be sacrificed to give to coal gas a property which has ceased to be of value is a loss to the community which should not be allowed to continue.

A Universal Calorific Standard.

I am, therefore, in entire agreement with what I believe to be the general sentiment of your leaders—that existing illumination standards should be abolished, and a reasonable calorific value (preferably uniform throughout the kingdom) be put in their place as the standard to which gas should conform. This would enable gas engineers to work with a definite aim, and with a great degree of certainty, because the experience of the past points pretty definitely to the means to be taken to secure such a result. It would thus be possible to increase the amount of gas obtainable from the coal employed; and the various coal-tar products to whose uses I have referred need no longer be destroyed by being burnt with the gas.

I deem it of great importance, not only to gas companies, but also to the country at large, that this introduction of a universal calorific standard for gas should take place without delay. It will put gas and its great rival, electricity, on an even footing in one important respect. Each will be paid in proportion to the amount of energy supplied to the consumer—in the one case in the form of thermal units, and in the other case in the form of electrical units. They will have as their confessed object the supply of a like public want, though by wholly different means. Each has

its advantages and its disadvantages; and it is by these that its field of use will become delimited. It is in my eyes an industrial mistake to aim at making either displace the other. But in order that the public may reap the full benefit of the two, each must be free to do its work in the best way it can, using all the advantages it possesses, both in respect of production and consumption, unhampered by needless or harmful restrictions. All this is already true in the case of electricity. But it is not true in the case of gas; and in the future that awaits gas companies it is clear that they will need all the liberty of action that is consistent with their real service to the public to enable them to hold their place in the new industrial conditions in which they will be placed.

Preparing for the Future.

This is a moment most suitable for considering what will be the characteristics of that future, and how we should prepare to take our place in it. The experience of the last few years at home and abroad shows it will differ widely from the past. In the first place, the capacities of electricity for concentrated production and wide distribution have been demonstrated, and are being industrially utilized far and near. The present state of things and the promise of the future are in this respect in wonderful contrast to the ideas which prevailed in the early eighties, when electrical distribution was first spoken of. I well remember hearing Thomas Hawksley, the veteran gas and water engineer, say in those days: "Electricity is like small beer; it should be brewed at home and consumed on the premises." Never has a prediction been more strikingly falsified, although it was that of a very sagacious man. Schemes of distribution of electricity of the most ambitious and far-reaching character are now being treated as part of practical politics, as may be seen from the report of the Electric Supply Committee which has recently appeared. It must not be supposed that in referring to them I wish to represent all these schemes as likely to be adopted in the near future, or even that in their entirety they will ever materialize. The calculations on which they rest have no doubt been carefully made; and in a world which enjoyed absolute immunity from civil disturbance, hostile aggression, and world-wide commercial intrigue, it might be quite practicable to sit round a table and decide questions of national policy by appeal to the slide-rule alone. But alas! this is not the case in this world of ours. There are many considerations other than those of mere technical efficiency that must come into play before one can decide on the extent to which centralization should be pushed. The primary necessities of civilization for our great town populations must be secured by being made to rest on bases so broad that they are safe from sudden disturbance. Centralization has its drawbacks as well as its advantages. But making all allowance for such considerations, I think that we must look forward in the near future to a strengthening and consolidation of electric distribution so far as it can safely be effected, and that in this development it will most probably receive support from public funds, and will certainly be assisted by largely extended statutory powers. Thus favoured, electricity will be in a position to offer a fiercer competition with gas companies in the domain of public lighting. And this furnishes to my mind a strong justification for the demand that there should at once be a revision of your statutory obligations. It is time that you should be free to order your work so as to fit best with what must eventually be the task which will be required from you.

Fuel Oil Production.

Turning to the other side of the picture, we have as a set-off against such an intensified competition the growing appreciation of the value-in-use of the bye-products of gas manufacture. A good example is that of fuel oil, which is in demand not only for consumption in our Navy, but in processes of oil-firing, which can be adjusted to wide variations in the character of the fuel used. The value-in-use of this fuel oil has been so marked during the war that research is now being energetically pushed forward to ascertain the conditions under which it can be produced in the largest quantities without affecting too seriously the production of other bye-products of even greater value. There is the prospect that analogous research will demonstrate the practicability of utilizing as valuable fuels portions of that which hitherto has been left unseparated in the tar, and even of using alone, or in combination with them, the least tractable of all your bye-products—viz., pitch. A market for the more volatile products (so far as they do not consist of substances too valuable to burn) is fully secured by the universal adoption of internal combustion engines for road traffic.

The Future of Ammonia.

Foremost among the bye-products which have an intrinsic value, apart from their use as fuel, are the members of the aromatic series, which are the foundation of our chemical industries. Here the position of the gas companies will be strengthened I trust by their finding a home market in the future, instead of having to export them at low prices to assist our rivals to compete with us in the finished products in our own markets. Above all, I feel sure that there will be a largely increased home market for ammonia. Our farmers have hitherto lagged far behind in the employment of fertilizers; and the nation has trusted to imports to satisfy the bulk of its demand for food. The war, however, has taught both the farmers and the nation a salutary lesson, and farmers are now ready and eager to use as much fertilizers as they can obtain. The war has shown the existence of a world-shortage of food under the old conditions of cultivation. That which Malthus foresaw and prophesied to unheeding ears has come to pass. Population has outrun food supply; and it has become a necessity to increase the yield of cultivated land. This means that there must be a much larger use of fertilizers in civilized countries; and this change will be specially great in our own country, and must show itself in an increased demand for ammonia for home use. It is precisely in your production of ammonia that there is the greatest room for advance. You leave unused much of the combined nitrogen that exists in the coal, and as to which there is evidence to show that it is capable of forming ammonia.

I have been pointing out changes in demand which will be in your favour, and possibilities of reward for successful research in connection therewith. But it must have occurred to many of you that there is another side to the picture—that research in other departments of industry may raise up new competition, and that demand may call into operation foreign sources of supply. This is all very true; and no more striking instance can be given than the threatened production of synthetic nitrogen at home, and the importation of suitable fuel oils from those foreign countries which produce petroleum. Such competition will not lessen the production of ammonia at home, for it is a bye-product too valuable to lose; and the same may be said to a certain extent of the other bye-products affected. But it will have an important effect on the prices obtained for them, and in extreme cases may even lead to the manufacture of some of them being abandoned.

Developing the Resources of the Country.

This brings strikingly before us one of the most difficult problems raised by the war. We have learnt by sad experience how costly it is to allow a country to neglect the development of its own internal resources merely because it could get its wants supplied cheaper or more easily by purchase from abroad. To do so with regard to munitions of war would be madness, as the supply would be endangered at the moment when it was most urgently required. But the same may be said of some things which are munitions of peace—things that are essential to the life of a nation at all times, in peace and war alike.

Home Produced Fertilizers.

We dare not let our own powers of production of such things fall into atrophy, trusting to obtain them from elsewhere. To do so to such an extent that national existence depended directly and immediately on such foreign supplies would be like attempting to keep a man alive by continued transfusion of ready-made blood, instead of making him produce his blood by his own natural processes. And it must not be thought that such atrophy is so unlikely to occur that it need not be provided against. If we neglect to make the most of our internal resources, the long continued waste of these resources gets embodied in our plant, in our methods of manufacture, and in our industrial organization; and when the time of trial comes, it may be impossible to eradicate it.

The Importance of Research.

The development of its own internal resources has a value to a nation not measured by the immediate economical returns. To reconcile the lessons so taught us with the sound principles of the interchange of products which

govern industrial life is a problem of overwhelming difficulty. No formula suffices to solve it—the solution must be found in the exercise of a wise judgment in the individual cases which present themselves. But one thing experience has taught me. Those who complain most bitterly of being killed by foreign competition are those who have troubled themselves least to make the best of home conditions and who have been most negligent in the research which is necessary to bring out the full capabilities of the means at their command. The true remedy of such difficulties is generally to be found in special research. The tendency of research as a whole is to kill the processes which are in the hands of the inefficient. This is just as it should be, and we should be prepared to accept the consequences. But where all that careful research can teach is being employed, the subtle adjustment of the value of raw materials and bye-products in the industrial market suffices far more frequently than we imagine to secure the prosperity of those who are making the best of the means at their disposal, poor as they may seem in comparison with your highly favoured rivals.

Fuel Conservation.

It is from this point of view that I envisage the future of the gas industry in Great Britain. Probably the most important industrial question in a country like ours is the proper utilization of its fuel supplies. At first the only method of treating coal was to burn it under boilers or in furnaces or grates in the form in which it was taken from the seam. But that is long past. The value of gaseous fuel, first illustrated by the gas industry, was permanently established by the internal combustion engine on the one hand and by the widespread use of gas furnaces in countless industries on the other; so that now an important proportion of the coal used is divided up into gaseous and solid fuel before being finally burnt. And the proportion is still growing, and promises to increase with advancing civilization. Now, gas companies are in the most favourable position to deal with this problem. When put under proper statutory regulations, they will be able to make their gas to the best advantage; and they are already in possession of the best market in which to dispose of it. The regularity of the demand and the conditions of production place them in an excellent position to control the nature of their bye-products so as to get the best economic return. To do all this so satisfactorily as to face the competition that will arise in the more energetic industrial world that we hope to see develop after the war will require an equal energy on their part—an equal readiness to improve their present methods where found imperfect.

The problems that present themselves are numerous. Investigations like those that your Committee on Refractory Materials has been carrying on show how much is yet to be done even in the way of determining the effect of your necessarily high temperatures upon the materials you use in construction. The battles that rage between the advocates of vertical, inclined, and horizontal retorts, of high and low temperature carbonization, of uniform or graduated temperature, of the use of steam or stripped gas to aid the flow of the gas from the retorts, and many other like subjects of discussion show how many questions are still unsettled, and how many active minds are at work in different directions to perfect your knowledge and increase your powers. All this must be welcomed by you; and where this research has led to clear and definite results, you must be ready to adopt them.

Developing the Utilization of Gas.

But the research which will make your industry able to face the difficulties of the future must not be confined to questions relating to production. It is equally important to you to develop the utilization of gas. There has been, I fear, too great a severance between the two. The means of rendering your products directly and conveniently utilizable to the public have been looked upon as something outside the purview of a gas engineer, not to say something beneath his notice. I think that in future a more liberal view should prevail. There is a solidarity of interests between those who cater for production and those who cater for utilization. Take the case of gas traction. I am glad to see that this Institution have been giving evidence before the Gas Traction Committee; and I hope that the help you will give to the movement will not be confined to this. In a country destitute of petroleum deposits, I think it quite possible that ordinary urban road traffic which now depends entirely upon petrol, might largely be done by gas if gas engineers would apply themselves to the problem, and get some more practical solution than the fragile and unsightly containers that the public have been ready to accept, and which have at all events shown the practicability of gas traction. All new uses of gas, and all uses that you make easier and more serviceable to the public, go to strengthen your position as producers and as suppliers. Your future will depend on how serviceable you are to the public. If I might use a phrase taken from my memories of Cambridge boating days, I should say that "no industry will survive that does not pull its weight in the boat." My view of the gas industry is, it could wish for no better test—that its value to the country is incalculable. This is recognized at the present time; and it will continue so to be recognized. And the industry will maintain its high position in social and industrial usefulness if it realizes that the exceptional conditions under which it exists make it more, and not less, incumbent on it to keep to the front in the activity of its research, and its readiness to adopt the best means for performing its important duties. By so doing it will not only render its future secure, but it will merit and win the gratitude of the country.

REPORT OF THE REFRACTORY MATERIALS RESEARCH COMMITTEE, YEAR 1917-18.

A large amount of work has been done during the year. The preparation of special bricks for investigation purposes referred to in last year's report has been completed. These have been tested for refractoriness, contraction, and crushing strength, and also refractoriness under load.

Sets of a hundred different kinds of bricks have been fired in industrial furnaces, five of which were removed after each firing (extending over eight days). These bricks have now been examined for the determination of the deterioration with the different periods of firing.

A considerable amount of work has also been done on the disintegration of fire-bricks by sand blast, and on the action of flue dust on refractory material. Appended is a report on the effect of load on the refractoriness of fire-bricks, &c. Reports on the influence of different kinds of flue-dust and the crushing strength of fire-bricks are being completed.

There has been great delay in obtaining the furnace required for testing the effect of variable atmosphere on refractoriness. When at last it was received, it was found that it was not to specification; but it is now being installed. The extent of the work which it has been possible to carry out is smaller than was hoped, owing to the fact that it has not been possible to obtain the services of more than one suitable whole-time assistant to Dr. Mellor.

The Committee have also decided to carry out an investigation on the manufacture of fire-clay retorts by the process of "casting," and to arrange for testing of them in gas-works under ordinary working conditions.

APPENDIX.

EFFECT OF LOAD ON THE REFRACTORINESS OF FIRE-BRICKS, &c.

[This is the first report of a series of reports on the properties of refractory materials, which are expected to follow in rapid succession.]

By J. W. Mellor and W. Emery.

The present report is a continuation of that presented in 1916. In the tests on fire-clays described in that report, disturbing factors, due to variations in the grain size, in the method of manufacture, and in the methods of firing, were largely eliminated by making the test cylinders by the same process, preparing the materials in the same manner, and conducting the test under approximately the same conditions. The two important empirical facts then established were:

1.—The refractoriness of a fire-clay under load diminishes as the load increases in accord with the rule: Refractoriness $= Ce^{-kW}$, where C denotes the refractoriness not under loads, W the load in pounds per square inch, and k a constant characteristic of each fire-clay. Every fire-clay has its own load constant k when determined under these conditions. The values of k ranged from 0·0030 to 0·0116 for a series of typical fire-clays, and the higher the value of k, the more sensitive the refractoriness of the clay to load.

2.—The sensitiveness of a fire-clay to load is greater the greater the "alumina" content of the clay, and the sensitiveness of a fire-clay to load is less the greater the "silica" content of the clay. This empirical rule has been

confirmed by a great number of further tests, although the exact connection has not been established. The rule has no reference to fire-bricks as usually made, since the rule was tested only with materials made up in a definite way.

In extending the investigation to bricks, it was necessary to devise a larger furnace; and after a number of failures, the furnace illustrated in fig. 1 was found to give excellent results. It is fairly simple in construction, and is based on the furnace used in the preceding tests, but adapted to larger pieces. It therefore requires very little explanation. The loading of the test piece is attained by means of a lever system. The one illustrated in the diagram gives a leverage of 12: 1, after which due allowance has to be made for the weight of the supports, &c.

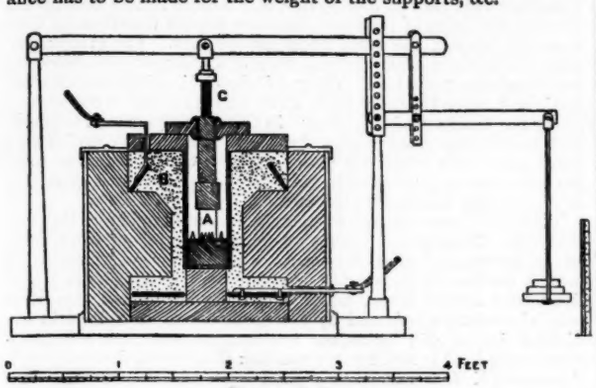


Fig. 1.—Furnace.

The refractoriness under load is determined in the following manner: The test piece is cut from the brick and ground to a rectangular block $3\frac{1}{2}$ in. long and 2 in. cross section. This presents a surface of 4 sq. in. to the load. The final measurements of the piece are taken with a micrometer slide-gauge. Much depends upon the careful preparation of this block. If the ends are not parallel, the weight will not act in a true vertical direction, but tend to thrust sideways.

A solid refractory support is bedded at the bottom of the inner tube of the furnace. A thin layer of powdered carborundum is spread over the top of this basal support to prevent the sticking of the test piece. The test piece is placed centrally on the support, so that all is quite level. Small Seger cones, arranged in series of four, are fixed on the basal support round the test piece. A cube $2\frac{1}{4}$ in. sq., of similar material to the bottom support, is placed on top of the test piece. This is followed by a cylinder—say, magnesite—and finally a carbon rod C mounted on an iron ring. The carbon rod is attached to the lever arm in such a way that it can be moved horizontally, so as to counteract any slight irregularities in the supports.

If the temperature rises at such a rate that cone 16 squats in about four hours, the difference in the temperature of the interior and exterior of the test pice is about 20°. The rate of heating is controlled by means of variable transformers and resistances. The current used varies from 8 to 10 K.W. As the temperature of the furnace rises, the thermal expansion of the brick causes the lever arm at first to rise, and later on the lever begins to fall.

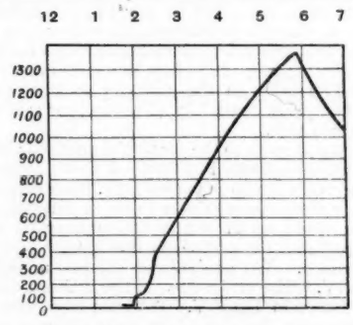


Fig. 2.—Outside Pyrom ter.

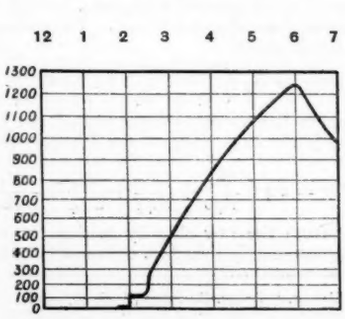


Fig. 3.—Inside Pyrometer.

The rate at which the deformation proceeds depends on the character of the test piece. When the squatting has reached the limit decided upon, the current is switched off, the weights, lever, and supports removed, and the cones observed. The test piece is left in the furnace until its temperature has cooled.

The first measurements were directed towards finding the relation between the temperature in the interior and exterior of the test piece. Briquettes of various sizes were made, some with one and some with two holes; so that pyrometers could be inserted from above the furnace through holes in the supports, and so into the test briquettes. It will be obvious that fallacious results could be very easily obtained if the interior of the badly conducting briquette is at an appreciably higher temperature than the exterior. A. V. Bleininger and G. H. Brown* examined this question, and plotted curves for their furnace, which indicated that after three or four hours' heating the temperatures inside and outside the brick are nearly identical. We have repeated the measurements for the furnace illustrated, and find that there is over 100° difference between the interior and the exterior of the brick on a three to four hours' heating, and also on a twelve to thirteen hours' heating.

This is illustrated by the four pyrometer charts reproduced in figs. 2, 3, 4, and 5. The pyrometers were checked by means of a reversing switch. This proved that the difference in the recorded temperatures is not due to a constant difference in the readings of the two instruments, but to a real temperature difference in the interior and exterior of the bricks. The need for keeping the interior and exterior of the test piece at as nearly the same temperature as possible, limits the size of the test piece. If the test piece be not greater than 1 sq. in. in sectional area, there are difficulties with pieces containing coarse grog, for such pieces are unduly weak mechanically. This is confirmed by the failure to obtain constant results under such conditions. Test pieces of 4 sq. in. sectional area were finally used. With these the temperature can be maintained so that the interior is 20° to 50° less than the exterior temperature on a four hours' heating. This determines the chief error of the experiments. The results indicated in the tables, therefore, require this correction factor.

TABLE I.—*Refractoriness of Commercial Fire-Bricks. Load, 50 lbs. per Square Inch.*

Mark.	Type of Brick.	Seger Cones. No Load.	Seger Cones. Loaded.	Remarks.
B1	Very hard	32–33	19–20	Deformed steadily
B2	Ditto	32–33	16–17	Ditto
C2	Hard	30–31	13–14	Steady at start, collapsed suddenly later
C3	Ditto	29–30	13–14	Ditto
D	Soft, poor texture .	20	14–15	Ditto
E1	Medium fired . . .	30–31	16	Deformed steadily up to end
E2	Ditto	31–32	16	Ditto
F	Very hard	30	14–15	Steady early on, collapsed later
G1	Hard	30	16	Steadily deformed all the way
G2	Ditto	29–30	15–16	Ditto
H	Ditto	29–30	15–16	Ditto
J	Hard, badly cored in centre	31	15–16	Steady at first, quicker towards finish
N1	Hard	28–29	16	Deformed steadily
N2	Very hard	30–31	15–16	Ditto
O	Hard	30	17	Deformed very uniformly and slowly
P	Soft, fine texture. .	30–31	14–15	Ditto
Q	Very hard, good texture	32–33	20–26	Ditto
R	Very hard	32–33	16–17	Ditto
S	Hard, poor texture .	26	14	Ditto
A2	Rather soft . . .	30–31	15	Ditto

* Bleininger and Brown. "Trans. Amer. Cer. Soc.," 12, 337; 1910.

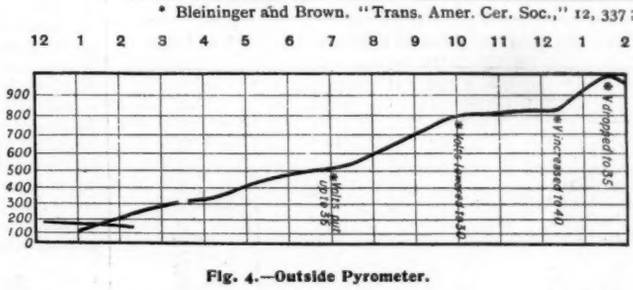


Fig. 4.—Outside Pyrometer.

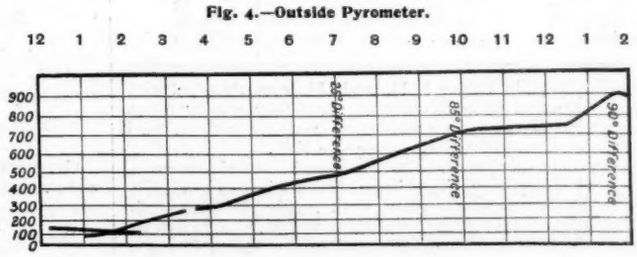


Fig 5.—Inside Pyrometer

The flux or matrix which binds the constituents of the fire-brick together is very different in the grog from what it is in the clay, even though the grog is made from the same clay as is subsequently used for making the bricks. This is due to the fact that in the grog the fluxes of the clay have dissolved so much of the less fusible constituents that it is less fusible and more viscous than the flux in the original clay. When the clay and grog are fired together, the flux of the clay softens at a much lower temperature than that of the grog; so that the fluxes of the clay and of the grog do their work independently.

Fire-bricks with coarse grog are liable to break-down mechanically by a diagonal shear, whereas with finer grog, the collapse appears as if the actual fusion temperature is reduced, for the test-pieces bulge as was the case with the fire-clays indicated in the previous report. During the burning of the fire-brick, the clay does not get so good a grip of coarse grog as with fine grog. See a later report on the crushing strength.

We are of the opinion that if a single specification test is to be prescribed for refractoriness under load, 50 lbs. per square inch is too great. A smaller load would give clays with a higher softening temperature a better chance. The most instructive test would be a curve showing the behaviour of the refractory unloaded, and with at least two different loads; but if one test is to be presented, a load of 25 or 30 lbs. per square inch will probably suffice.

TABLE II.—*Refractoriness of Commercial Silica Bricks. Load, 50 lbs. per Square Inch.*

Mark.	Type of Brick.	Seger Cones.		Remarks.
		No Load.	Loaded.	
A1	Silicious brick, rough red and white silicious grog	31–32	19–20	Steady at start, collapsed suddenly later.
K	Soft, red, fine even grain	29	3	Collapsed without any deformation.
L1	Hard, reddish, fine even grain	30–31	15	Collapsed after slight deformation.
L2	Very hard, rough grog	32–33	30–31	Ditto.
M	Soft, white, fine even grain	30	14–15	Deformed steadily.
C1	Soft, white, medium even grain	33–34	17	Deformed very quickly.

In general, the silica bricks stand up under load very much better than fire-bricks made from fire-clays; but the finer grained silica bricks do not stand under load so well as the coarser grained silica bricks. Indeed, very fine grained silica bricks show as large a difference between the normal refractoriness and the refractoriness under load as bricks made from fire-clays.

TABLE III.—*Refractoriness of Commercial Special Refractories. Load, 50 lbs. per Square Inch.*

Mark.	Type of Brick.	Seger Cones.		Remarks.
		No Load.	Loaded.	
T	Magnesite	>40	18	Deformed slightly, then collapsed.
V	Chromite (German)	>40	13–14	Ditto.
Z	Zirconia	>40	15–16	Gradual from start to finish. With a load of 25 lbs. per sq. in., the bricks squatted between cones 26 and 27; and with a load of 75 lbs. per sq. in., between cones, 14 and 15.

The analysis of the magnesite and zirconia bricks are as follows:

	Magnesite Brick.	Zirconia Brick.
Silica (SiO_2)	5·22	10·91
Titanic oxide (TiO)	—	1·25
Alumina (Al_2O_3)	1·57	3·92
Ferric oxide (FeO)	0·75	4·11
Manganese oxide (MnO)	—	under 0·01
Magnesia (MgO)	88·48	0·21
Lime (CaO)	2·96	0·16
Potash (K_2O)	0·03	0·36
Soda (Na_2O)	0·25	0·38
Zirconium oxide (ZrO_2)	—	75·95
Loss on ignition	0·03	2·40

The results shown in Tables I., II., and III. were obtained with fire-bricks as supplied by manufacturers; and they may be taken as representative of the refractoriness of fire-brick without load and when under a load of 50 lbs. per square inch.

Fire-bricks under load seem to break down in one of two ways. In one type of collapse (*fusion collapse*) the fire-bricks gradually give way as the temperature rises, until finally the piece collapses. This behaviour is typical of aluminous and zirconia bricks. The breaking-down temperature indicated in the tables is not a definite temperature, but rather an arbitrary range of temperature during which the brick has sunk (say) 1 in. In the second type of collapse (*mechanical collapse*) the fire-brick may show symptoms of a gradual deformation; but the characteristic feature is a more or less abrupt collapse. This is typical of silica and siliceous bricks, and, to a less degree, of magnesite and chromite bricks, although sufficient varieties of the latter have not been determined to give the same confidence in making general statements.

The effects produced are exceedingly complex; and they are affected by many factors other than composition. The texture is one of the most important, as emphasized in a paper by one of us some time back.* But even here are cross results. As a first approximation, a firebrick can be regarded as a mixture of certain materials which are difficult to fuse with a more fusible constituent. During the firing of the brick the more fusible constituents form a matrix binding the other materials together. The matrix, particularly in the coarser grained materials, seems to determine the refractoriness under load. The red firebrick K collapses under load at Cone 3, when the same brick under no load does not collapse till Cone 29—nearly 500° C. higher. In this case, the matrix suddenly lost its binding power under the load. A firebrick fortified with silica grog may stand up under no load better than the brick without this grog; but with the load the ground mass gives way without being fortified by the grog.

When this investigation was planned some time before the war, when Mr. Bywater was taking an active part in our work, most of us anticipated that fire-bricks would show variations that would enable us to specify a minimum refractoriness which fire-bricks should stand under a definite load; and this view was afterwards confirmed by the specification of a load in the United States. So far as our examination goes, the refractoriness under load is much more complex than was at first supposed. Specimen K does exceedingly good work in the building of the settings of gas-retorts—in fact, it has long been a favourite. It collapses mechanically at Cone 3, approximately 1140° C (or 2084° Fahr.), under a load of 50 lbs. per square inch. This seems an exceedingly bad result. I think it is very fortunate that we have been very cautious in specifying tests, or a blunder would have been made.

How comes it that a brick can possess a refractoriness under load which is far lower than the temperature at which the brick is doing good work in a furnace? A brick was made with three borings, respectively 7, 5, and 4 in. deep; and pyrometers were fitted into the holes, illustrated in fig. 6.

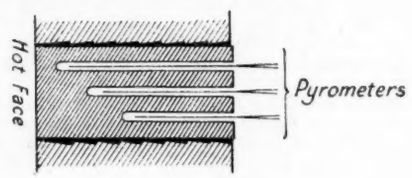


Fig. 6.

In the steady state, when the face of the brick is at 1000° C., the temperature of the interior is:

	Hot Face.	3½ in. Away.	4¾ in. Away.	6½ in. Away.
Temp.. . .	1,000° ..	720° ..	570° ..	350°

Under normal conditions, the temperature of the interior would probably be hotter than this; but in any case, it follows that although the face of the fire-brick may be soft under a load, further inwards the temperature is lower; and if the brick is not inclined to spall, the softening of the face would in most cases do good, not harm. The brick in the masonry is also supported differently from a test-piece heated in a furnace, for it is not free to bulge except on one side.

In view of our ignorance as to the particular methods of manufacture of the fire-bricks indicated in Tables I. to III., a few series of fire-bricks were made up in a known way, from clays known to be good and also from those known to be of inferior quality. These bricks were made up in a uniform manner on a brick works. It was hoped that the variations introduced would bring out definite information. The analyses of the raw materials are indicated in Table IV. The grain sizes of the different materials supplied to us are shown in Table V. It would have been better to thoroughly disintegrate the clays into their ultimate granules by various well-known artifices; but the results would not then have met the purpose of the present work—viz., to find the effects produced under ordinary working conditions. The surface factors are calculated by the formula†

$$\text{Surface factor} = 2{\cdot}4\left(\frac{W_1}{d_1}+\frac{W_2}{d_2}+\frac{W_3}{d_3}+\frac{W_4}{d_4}\right)$$

where d_1, d_2, ... denote the average diameters of the fractions; and W_1, W_2, ... the percentage weights for the particular fractions in question,

$$\text{Surface factor} = 2{\cdot}4\left(\frac{W_1}{1{\cdot}76}+\frac{W_2}{0{\cdot}44}+\frac{W_3}{0{\cdot}14}+\frac{W_4}{0{\cdot}066}\right)$$

Grog was made from the raw clay by mixing the clay with water, moulding approximately into 8 in. cubes, drying, and firing

* J. W. Mellor, "Trans. Cer. Soc.," 16, 40, 1916.

† J. W. Mellor, "Trans. Cer. Soc.," 9, 94, 1910.

some to Cone 10, some to Cone 1. The fired blocks were ground and graded as follows:

Fine . . . . passes through a 16s riddle.
Medium . . . remained on a 16s riddle passed through an 8s.
Coarse . . . remained on an 8s riddle passed through a 4s.

The grog and clay were re-combined in the following proportions, indicated in Table VI. The materials were proportioned at the laboratory, and mixed on the Cobridge Brick-Works by shovels; and, after a good soaking, they were again mixed by treading. This treatment ensures that the original grading of the grog is not altered as might have occurred had the mixing been done in the pan.

The A B series were hand-made and allowed to stiffen by partial drying. They were then re-pressed in Johnson's hand press; the M2-4-5-6 series were made in the press without the preliminary hand moulding. The bricks were then slowly dried, fired to Cone 2 in a Newcastle kiln, and afterwards to cone 10 in a down-draught kiln. Otherwise, the bricks were made under ordinary working conditions with regular workmen under Mr. Audley's supervision. The results are indicated in Table VII.

TABLE IV.—*Analyses of Raw Materials, by Mr. C. Edwards.*

—	O	D	V	S	Z
Silica (SiO_2)	53·84	61·88	55·90	49·55	51·24
Titanic oxide (TiO_2)	1·32	1·14	1·47	1·67	1·39
Alumina (Al_2O_3)	25·73	22·37	27·74	30·30	28·06
Ferric oxide (Fe_2O_3)	5·25	3·00	2·06	1·56	1·88
Magnesia (MgO)	0·83	0·44	0·40	0·69	0·33
Lime (CaO)	0·54	0·32	0·30	0·30	0·40
Potash (K_2O)	1·48	1·42	1·31	1·45	1·20
Soda (Na_2O)	0·27	0·36	0·49	0·48	0·24
Loss on ignition	11·04	8·72	10·78	14·34	14·74
Calculated Rational Analyses.					
Felspar	59·5	51·0	64·4	70·5	66·2
Clay	10·5	10·7	10·8	11·6	8·6
Quartz	20·9	32·5	20·7	11·2	16·6
Lime	5·25	3·0	2·06	1·56	1·88
Iron oxide	0·54	0·32	0·30	0·3	0·40

TABLE V.—*Sieve Analyses of Raw Clays.*

—	O	D	V	S	Z
Stays on 20's	22·7	67·1	35·0	62·8	65·0
,, 80's	44·5	23·5	40·2	31·4	23·2
,, 120's	17·2	8·8	21·0	2·6	10·0
Through 120's	15·7	0·5	4·2	3·1	0·7
Surface factor	1139	388	780	414	412

TABLE VI.—*Mixing Chart with Easy and Hard-Fired Grog.*

Laboratory Mark.	A B Series. Grog Fired to Cone 10.		Laboratory Mark.	E M Series. Grog Fired to Cone 1.	
	Clay.	Grog.		Clay.	Grog.
A1	1	1 fine	E2	1	1 medium
A2	1	1 medium	E4	2	1 fine
A3	1	1 coarse	E5	2	1 medium
B1	3	2 fine	M1	—	—
B2	3	2 medium	M2	1	1 medium
B3	3	2 coarse	M4	2	1 fine
A4	2	1 fine	M5	2	1 medium
A5	2	1 medium	M6	2	1 coarse
A6	2	1 coarse	—	—	—

All M. machine made.

TABLE VII.—*Refractory under Load of Experimental Bricks (50 lbs. per Square Inch).*

Mark.	Mixture.	V	Z	O	D	S
		Cones.	Cones.	Cones.	Cones.	Cones.
A1	1 clay 1 fine grog	14–15	10–11	13–14	8	14
A2	1 clay 1 medium grog	16	13–14	13–14	9–10	11–12
A3	1 clay 1 coarse grog	14	8	13–14	10–11	11–12
B1	3 clay 2 fine grog	16	12	14–15	11	13–14
B2	3 clay 2 medium grog	15–16	10	14–15	10	13–14
B3	3 clay 2 coarse grog	16	10	13	11	14
A4	2 clay 1 fine grog	17–18	9	13	13–14	14
A5	2 clay 1 medium grog	14–15	8	13–14	13–14	12–13
A6	2 clay 1 coarse grog	15	9	13	13	13–14

All the V series deformed very steadily.
The Z series collapsed very quickly once they had started, especially A3, B3, and A6; the failure being usually diagonally.
The O series deformed steadily, and all were more or less vitrified.
The D series collapsed suddenly once they had started, especially A5, B3, and A6. They usually cracked diagonally.
All the S series deformed fairly regularly and uniformly. A3, B3, and A6 broke diagonally.

TABLE VIII.—*Refractoriness of Experimental Bricks under No Load.*

(Extremes of the sets indicated in Table VII.)

Brick.	Softening Cone.	Brick.	Softening Cone.
VA3	31–32	OA3	20
VA4	30–31	OA4	20–26
		DA3	26–27
		DA4	20–26
ZA3	31	SA3	31
ZA4	31	SA4	31

The conclusions from the Table VII. tests are as follows:

Size of Grog Constant, Proportion Variable.—The less the proportion of fine grog to clay, the higher the refractoriness under load with V and D series. With the O and S series there is no appreciable difference. The breakdown with Z series points to the possibility of a maximum effect being obtained with a particular proportion of fine grog and clay; and taken in conjunction with the other series, this maximum will vary with each clay. Similar remarks apply with the medium and coarse sizes of grog; but the effects are less marked.

Proportion of Grog Constant, Size Variable.—In fifteen sets of experiments increasing the size of grog had no specially marked effect on seven of the sets, it decreased the refractoriness of five of the sets, it increased the refractoriness in one set, and showed a maximum in two of the sets. These three anomalous results want investigating further, to find if they are due to any peculiarity in the clay, or to errors in work. It will be observed that the grain of the clay, the possible and actual deflocculation, is an uncertain factor. This point will be taken up again later.

In order to find if the firing temperature of the bricks has any influence on the refractoriness under load, some bricks were re-fired to cones Nos. 15-16 for two hours; and the bricks became much more resistant. For example, the ZA4 series collapsed at cone No. 9 under a load of 50 lbs. per square inch with bricks burned at cone No. 10, and the bricks collapsed at cones Nos. 14-15 when they had been burned at cones Nos. 15-16. This makes it probable the flux, or whatever it is which binds the constituent parts of the fire-brick together, during the burning, is less viscous with fire-bricks burned to cone No. 10 than with fire-bricks burned to cone No. 16. It is probable that the fluxes during the burning of the brick are dissolving the less fusible constituents, and thus become more and more viscous. With fire-bricks burned at cone No. 10, the fluxes are still capable of dissolving more of the less fusible constituents; so that by thoroughly burning the bricks at a high temperature, the binding flux is stiffened, and the resulting fire-brick is more resistant to refractoriness under load.

To assist readers, the following table is reproduced from the Standard Specification of the Refractory Materials Committee.

SOFTENING POINTS OF SEGER CONES.

Cone No.	° C.	° Fahr.	Cone No.	° C.	° Fahr.
022	600	1112	9	1280	2336
021	650	1202	10	1300	2372
020	670	1238	11	1320	2408
019	690	1274	12	1350	2462
018	710	1310	13	1380	2516
017	730	1346	14	1410	2570
016	750	1382	15	1435	2615
015a	790	1454	16	1460	2660
014a	815	1499	17	1480	2696
013a	835	1535	18	1500	2732
012a	855	1571	19	1520	2768
011a	880	1616	20	1530	2786
010a	900	1652	26	1580	2876
09a	920	1688	27	1610	2930
08a	940	1724	28	1630	2966
07a	960	1760	29	1650	3002
06a	980	1796	30	1670	3038
05a	1000	1832	31	1690	3074
04a	1020	1868	32	1710	3110
03a	1040	1904	33	1730	3146
02a	1060	1940	34	1750	3182
01a	1080	1976	35	1770	3218
1a	1100	2012	36	1790	3254
2a	1120	2048	37	1825	3317
3a	1140	2084	38	1850	3362
4a	1160	2120	39	1880	3416
5a	1180	2156	40	1920	3488
6a	1200	2192	41	1960	3560
7	1230	2246	42	2000	3632
8	1250	2282			

Compound Fertilizers Order.—An Order (which supersedes previous Orders of Oct. 13 and Nov. 14, 1917) has been issued by the Minister of Munitions, to take effect from June 5, by which new maximum prices are fixed for compound fertilizers, the basis price being the aggregate value of the nitrogen, phosphates, and potash contained in the compound fertilizer, after valuation at the unitary rates set out in the schedule. The "unit" is 1 p.ct. by weight in 1 ton of fertilizer. For nitrogen derived from sulphate of ammonia, &c., the unit rate is 18s. 6d.

GENERAL REPORT.

The Annual General Meeting of the Institution was held last Tuesday and Wednesday, at the Institution of Civil Engineers, Great George Street, Westminster. The Right Hon. Lord Moulton, G.B.E., F.R.S. (the President), occupied the chair.

Confirmation of Minutes.

The President (who was very heartily received) opened the meeting by saying: The first matter before this meeting is the question of the minutes of the last meeting, which have to be read and confirmed.

Mr. Samuel Glover (St. Helens): Will someone, as is the custom, propose that they be taken as read?

Mr. H. E. Jones (London): To shorten the proceedings, I propose that they be taken as read.

Mr. C. E. Jones (London): I beg to second that.

It was agreed to.

Appointment of Scrutineers.

The President: The next matter is the appointment of Scrutineers to examine the ballot-lists for the election of officers and members of Council for the ensuing year, and of members and associate members.

Mr. Hubert Pooley (Leicester): I propose that Mr. J. W. Auchterlonie, of Cambridge, and Mr. R. W. Edwards, of Aldershot, be appointed Scrutineers.

Mr. D. Irving (Bristol) seconded; and it was agreed to.

The Birmingham Medal.

The President: The next thing is the presentation of the Birmingham Medal to Mr. John West. [Applause.] Mr. West, it is with the very greatest pleasure that I perform this duty—a pleasure which does not always fall to the lot of the President of this Institution, because the Birmingham Medal is only awarded at intervals of time. But I am satisfied that I am speaking the opinion of the whole of my audience when I say that to no one could it have been given who merited it more, or whose reception of it would have given greater pleasure to the members. ["Hear, hear."] Although I am not qualified to be the historian of this Institution, I do know the name of the successful plant that is adopted so largely; and I have read again and again of the services that Mr. West has performed for the gas industry. ["Hear, hear."] Now, the gas industry is the affair of you all. It is like your country, you have got to fight for it; and those who give you yeoman aid in so doing, rightly merit—and I am sure receive—your gratitude. Now, no more veteran supporter of your cause could be found than Mr. John West. He can look back over a long series of years in which he has employed his great ability and great experience in the advancement of the gas industry; and he has done so with success. Therefore, in your name, I, with the greatest personal pleasure, and the greatest pride on your behalf, have the honour of presenting to him this medal, which is the most distinguished mark of approbation which your Institution can give of the services of one of its members. [Applause.]

Mr. John West: Mr. President, ladies, and gentlemen,—I thank you, Mr. President, for the very kind words which you have been pleased to say about me. I appreciate them very highly; and, of course, I may be pardoned (I know you will pardon me) if I say I feel proud to possess this medal. It is an honour which you have conferred upon me, and which I appreciate beyond measure. I thank you heartily for it; and it comes with double pleasure to me, because I do know that you are as pleased to give it to me as I am to receive it. ["Hear, hear."] It will be a stimulant for the future. [Laughter and applause.] Though in his eightieth year, I hope the old dog is not done yet. Nothing could put more enthusiasm into me than the pleasure I have at your kind approval and consideration of what I have tried to do for the benefit both of the gas industry and of the Ministry which requires so much of all your help. I have always received your help during the time this war has been going on. All this your President knows about; and he has told you how much he appreciates you—and almost said he loves you. My feeling is in that direction. You have done so much; but you cannot stop yet. I must beg of you to do a little more; and then you will please the President, and please me, and everybody else. Mr. President and gentlemen, I thank you for the honour which you have conferred upon me.

The Presidential Address.

The President (who was again heartily applauded) then proceeded to deliver his address, which will be found on pp. 475-78.

At its conclusion,

Mr. H. E. Jones said: Lord Moulton and gentlemen, if any proof were needed of the incomparable advantage to this Institution that a man of Lord Moulton's distinction in science should have accepted the chair for the past year, that proof has been found beyond all dispute in the exhaustive and complete address—the classical address, showing profound thought in every direction—to which we have listened. Not merely has Lord Moulton been content with having commanded an army of gas men in the last year—men derived, as he has shown us, from peaceful pursuits—to bring forth the products he has demanded in the High Explosives Department, but he has gone beyond this, and to-day has propounded for us a future policy. He has been our guide, and counsellor, and friend, and has examined this question with great profundity of thought. He has told us something of our political duty, and has shown us our legal position and its advantages and drawbacks. He has in every way shown us on the scientific and the philosophical side what are the real resources behind the great industry which this Institution so well represents. No language that you could employ (or that I could employ on your behalf) would sufficiently recognize the vast importance and the value of the address that we have just heard. I think it will go forth as illustrating that this Institution stands—as it should do—in a very high position in the scientific world, when we can have such an address given us by so distinguished an authority. ["Hear, hear."] Lord Moulton has shown us to-day what a terrible rival he would be for some of us in the directorial seats of the gas companies, or still more if he entered into the arena as engineer for some of these large undertakings. I think we should find it very difficult to live up to the standard he would set before us. He has, in fact, loaded us with advantages; and on behalf of the Institution, as a Past-President and as a very old officer and fellow-worker, I tender him our most profound gratitude that he should have given us the enormous amount of care and attention that he must have devoted to the preparation of his very valuable communication. Our annals for all time will be enriched by this address, which will be one of the best vouchers and testimonials to the real scientific value that attaches to our Institution that ever happened in the history of the organization. I cannot sit down without saying, as an old gas engineer, with what pleasure I have seen to-day one of our really valuable, practical members receive the high award of the Birmingham Medal, in the person of Mr. John West. Those of us who go about the kingdom as much as it has been my good, or ill, fortune to have done, have been constantly encountering his works, and finding that they persevere. They continue, they persist in the good work they were originally designed to carry out; and personally I should like to pay a tribute to the great practical success of Mr. West's systems and his processes. He taught us the value of a good furnace, a good big retort, and a good machine; and some of the last-named are working to-day, though they do not altogether conform to the slanting, vertical, and other arrangements. Mr. Hawksley's name has been mentioned; and as he has now gone from us, I should like it to be remembered that he proposed to help us to get a home in London. Whether we ever can get a home in London is a matter of great doubt and difficulty, because you gentlemen are placed locally all over the kingdom, and a home in London would not mean so much to you as the building we are now in means to the majority of the civil engineering profession. But Mr. Hawksley had this matter for many years at heart; and your funds will be the worse off for his having gone, because he was a generous man, and he had proposed to assist in the provision of a home. Our funds for this purpose are slender. I know that we contribute an annual subscription which is a small one, meeting the means of most of us. But I think that an Institution like this, that

can deal with questions such as have been put before you in the address—the investigation into the constituents of coal gas—and look into the matter of the life of meters, and so on, has a right to say to the great companies who possess the wealth of this country as identified with gas, that they should assist our means. In saying this, I am reminded, as the Chairman of a foreign Company working in France, that it is the universal custom in that country for the great industries of gas to subscribe to the Société Technique, which represents the interests there that we represent in this kingdom. I think that you will have good ground for approaching the companies and corporations in the way of supporting the Institution, so long as you give such valuable services as you have been doing.

Mr. A. E. BROADBERRY (Tottenham): Lord Moulton, ladies, and gentlemen, it gives me very much pleasure indeed to be allowed to second this vote of thanks. When we saw the opportunity present itself, and that we might be honoured by Lord Moulton accepting the presidency of our Institution, none of us had the slightest doubt as to the line of duty towards the Institution which lay before us in making the selection. During the year that Lord Moulton has occupied the position of President, he has taken such a deep and keen interest in the whole of the work of the Institution that we have been very glad, and very grateful ever since that we asked him to do us the honour to become our President. The work he has done, and the interest he has taken, culminate to-day in the most excellent address to which we have listened; and I am sure that, full as it is, it does not even now contain all the reflections that it might on the work that Lord Moulton has done for the Institution during his year of office.

Mr. SAMUEL GLOVER: You have heard it moved and seconded that our best thanks be given to his Lordship for his most excellent address. Those who approve will please show it in the usual way. [Loud applause.] Lord Moulton, you have heard the hearty manner in which the vote has been proposed, seconded, and carried unanimously. I thank your Lordship for your helpful address.

The PRESIDENT: Ladies and gentlemen, a vote of thanks is quite unnecessary on an occasion like this, because a man must be strangely out of sympathy with the life of his country if he does not realize what a privilege it is to be allowed to address an audience like this on subjects of such national importance, and which are so close to his heart. Your vote of thanks was given in the attention you were good enough to accord to my remarks. I am afraid that, copious as the address was, it was, after all, only a text on which I want you to reflect, and to write for yourselves a full sermon. I want you to realize that, while, on the one hand, you are bound to insist that you shall be unhampered in doing that which, in fact, is all that the public requires, or can usefully employ in the way of gas, this freedom from unnecessary restrictions has got to be used by you in developing all the other methods in which you can be industrially useful to your country. I want you to feel that the very security of your position—the statutory establishment of the status of a gas company in its sphere of action—is no excuse for its being less active than others. It might remove from it the stimulus of some competition; but this only means that you ought to supply this stimulus from your own high ideals. You should not need the stimulus which in industrial concerns is often the only active motive. I want you to feel responsible for making the very best use of the powers that you have—insisting that you shall not be interfered with unnecessarily in the choice of the method of making such efforts. If the gas companies go on this principle, and if the earnest thinkers that I am addressing do themselves justice in that line—and of this I have no fear—I am satisfied that the future of gas companies will be more secure, and that the benefits they bestow on the public will be greater than they ever have been in the past. I thank you. [Applause.]

Alteration of Subscription.

The PRESIDENT: I have now to perform a function which I would not say reminds me of my childish days, when "after the sermon came the collection." [Laughter.] But I have to submit, on behalf of the Council, two motions in respect of an increase in the subscriptions. The first is—

> That the last sentence of Article 12 (*a*) be altered to read: "and every member shall pay an annual subscription of two guineas."

I do not think, if it has received the approbation of your Council, that it needs any words of recommendation from me. But remember this is the embodiment of the social life of the Institution; and you ought not to starve it. This needs no proposer or seconder, as it comes from the chair; and I ask those who are in favour of it to indicate the same in the usual way. Against it. Carried unanimously. The second motion is—

> That the last sentence of Article 12 (*b*) be altered to read: "and every associate member and associate shall pay an annual subscription of one guinea and a half."

I put that in the same way. Those who are in favour. Against it. That is carried unanimously.

Annual Report and Accounts.

[The report was noticed in the issue of the "JOURNAL" for May 21, pp. 329-31.]

The PRESIDENT: I now have to move—

> That the annual report of the Council and the statement of accounts, a copy of which has been sent to every member of the Institution, be taken as read, and that they be adopted.

Mr. C. E. JONES: I shall have pleasure in seconding the motion. It has been my province in times past to severely criticize the reports of the Council; but on this occasion it meets with my entire approbation.

The PRESIDENT: Is there any discussion desired on the subject of the report, because now is the time?

Mr. GEORGE HELPS (Nuneaton): I had not intended to say anything on the report; but I think I had better say a word. There are two points to which I should like to draw attention. The first is in regard to fuel oil for the navy. There was a meeting which took place in Manchester; and I understand that only those gentlemen among us who use vertical retorts were invited. There occurs to me—and I daresay it occurs to a good many other people—this question: Is it only tar oil that is produced from vertical retorts which is required, or does the country want as much tar oil as possible produced from the ordinary horizontal retorts? That is one point, which I think is important. Of course, we all know that there are some fanatics going about the country talking about doubling the tar oils from ordinary carbonization; and the suggestion, I believe, is that to make up the quantity of gas, he puts in air, or some such stuff, and calls it an explosive mixture. I believe that it has been whispered that this very man has been known, and has been seen in Germany. [Laughter.] That is all I have to say upon this point.

A Suggestion for Hon. Membership.

The other matter is, perhaps, more pleasant and less humorous. We have to-day honoured Mr. John West, and chiefly, I believe, on account of the great work he has done in the introduction of vertical retorts; and in speaking of vertical retorts, the name of Thomas Settle always occurs to my mind. I do hope I am not out of order; but I think we ought not to let Thomas Settle be outside our doors. ["Hear, hear."] He did great work in the early days; and it is so difficult in the early days to do anything. Any fool can work when a thing is on the line; but the job is to get it from the plough land to the rail. So if we cannot admit him under the rules as an ordinary member, I would like you to see if there is not some way of bringing him in as an honorary member.

Mr. SAMUEL GLOVER: I should like to promise at once that the Council will take into consideration Mr. Helps's kind suggestion with reference to Mr. Settle. [Applause.] As to Sir Arthur Churchman's request in the matter of fuel oil, he and his Department are very anxious that everybody should produce as much as can possibly be produced; and every gallon of fuel oil that is produced in every gas-works in the kingdom is being looked after and utilized to the best advantage of the nation's needs at the present time. Are there any further remarks in regard to the report?

The PRESIDENT: There seems to be no desire to prolong the discussion, so I will put the motion to the meeting. It is carried unanimously.

The meeting was then adjourned until Wednesday morning.

Benevolent Fund Meeting.

At the opening of the session on Wednesday morning, the annual meeting was held of the donors and subscribers to the Benevolent Fund—the PRESIDENT occupying the chair.

The HON. SECRETARY (Mr. Walter T. Dunn) read the minutes of the last meeting and the annual report of the Committee. [The report was noticed in the "JOURNAL" for May 21, p. 331.]

The PRESIDENT: I move from the chair the adoption of the report. Will someone second it?

Mr. A. E. BROADBERRY (Tottenham): I have pleasure in seconding that.

It was agreed to.

A Handsome Donation.

The PRESIDENT: The election of two members of the Committee of Management to succeed those retiring by rotation has been announced—Mr. W. B. Farquhar, of Ilford, and Mr. William W. Woodward, of Salford—and also the election of Mr. Alexander Masterton, of Edinburgh, to succeed Mr. James Macleod, of Glasgow. I have great pleasure in reading a letter which has just been received by Mr. Dunn from Mr. John West, who says: "I have much pleasure in sending you a donation towards our Benevolent Fund." The donation, I understand, is £100. I think that, although it is not on the *agenda*, I may with confidence put before you a motion that the hearty thanks of the Institution be tendered to Mr. West for his very liberal donation. Is that the sense of the meeting? [Agreed.]

Mr. SAMUEL GLOVER: I should like, before the business of this fund concludes, to say that the Committee purpose putting the donation from Mr. West to capital account, and not using it for current expenses. They thought the subscribers would approve of this step being taken, as the best way to retain recollection of Mr. West's donation, and the best way to use the money for the fund.

The PRESIDENT: That concludes the business so far as it relates to the Benevolent Fund.

Report of the Refractory Materials Research Committee.

[The report is given on p. 478.]

The PRESIDENT: The general business of the Institution will now be resumed; and I call upon Dr. Colman to put before you the report of the Refractory Materials Research Committee for the year 1917-18.

Dr. HAROLD G. COLMAN (London): My Lord Moulton and gentlemen, in moving the adoption of the Refractory Materials Committee's report, I wish, in the first place, on behalf of the Committee, to express our high appreciation of the large amount of experimental work which has been carried out by Dr. Mellor and Mr. Emery during the past year. The extent of this work can only be very approximately judged from the communication which is published as an appendix to the report. This appendix relates only to one of the matters under investigation—namely, the effect of load on the refractoriness of fire-bricks—though it had been hoped that it would be possible to publish simultaneously several other communications, in which investigation is approaching completion. As these will be completed shortly, the Committee recommend that, when it is ready, the reports on them should be published in the "Transactions" for 1918, and not held back till the annual meeting of 1919. The sole reason why these researches are not yet sufficiently complete is due to the fact that, with the prevailing shortage of trained investigators, it has not been possible, as intended, to appoint a second whole-time assistant to Dr. Mellor, in addition to Mr. Emery. The hopes recently entertained that a second assistant had been found have, I regret to say, not been fulfilled. The further report on the effect of load on refractoriness will be found of great interest, though, as is so frequently the case, the results open-up further points requiring investigation. It will be remembered that, two years ago, Dr. Mellor reported on the effect of load on the refractoriness of the different fire-clays themselves, and showed that the refractoriness diminishes in accordance with a definite rule. The investigation was then continued on manufactured bricks, both on those purchased in the open market and on bricks specially manufactured from known fire-clays in a known manner. This involved working on larger test-pieces; and the apparatus for the purpose had to be modified for the change, which involved much time and trouble, but was eventually satisfactorily accomplished. Without going into details, which can only be satisfactorily assimilated by a study of Dr. Mellor and Mr. Emery's communication, it may be stated generally that the results obtained show that the effect of pressure or load is more complex than had been anticipated. Thus it tends to bring about two types of collapse. In one of these (fusion collapse) the fire-bricks gradually give way as the temperature rises, until finally the brick collapes; while in the second (mechanical collapse) the characteristic is a more or less sudden collapse. The first kind of collapse is characteristic of alumina and zirconic bricks; and the second kind of silica, and, to a lesser extent, of magnesite and chromite bricks. The size and proportion of grog employed, and the temperature of firing of the bricks in the kiln all have influence. But the information in these respects is incomplete, and requires further investigation. When this research commenced five years ago, one of the main objects in its initiation was the hope that from the results obtained it would be possible to specify a minimum refractoriness for fire-bricks under a definite load, instead of, as at present, only specifying the refractoriness without load. This was generally felt to be advisable, as in practice bricks are normally under load; but it was equally felt that, without investigation of the matter, which had then been little studied, the introduction of such a test might do more harm than good. This caution, as Dr. Mellor points out in his report, proves to have been justified. It will be seen, for example, that one brick which has for many years done exceedingly good work in gas-retort settings, gives exceedingly bad tests under load, in spite of the good results that it gives in practice. In a setting, the manner in which the brick is subjected to pressure must vary considerably in different positions; and the manner of the pressure, as Dr. Mellor shows, may be of at least equal importance to its magnitude. The devising of a method of testing under load in which the brick will be subjected to pressure in the same manner as in the setting, may prove to be a matter of great difficulty. The reports which it is expected will be ready in time for inclusion in the 1918 "Transactions" are those on the influence of different kinds of flue-dust, and on the crushing strength of fire-bricks. The actual experimental work on these is nearly completed; but the critical study and co-ordination of experimental results, amounting to many hundreds, is a matter requiring time, as those who have carried out similar work will readily appreciate. A considerable amount or work has also been done on the disintegration of fire-bricks by sand-blast; and, after many difficulties, the furnace required for testing the effect of variable atmospheres on refractoriness has now been got into working order. In addition, in conjunction with the manufacturers, the Committee have decided to carry out an investigation on the manufacture of fire-clay retorts by the process of casting, and to arrange for the testing of them in gas-works under all ordinary working conditions. Negotiations with regard to the proposed Association for Refractories Research, for the co-ordination and further development of such work on refractory materials (referred to in last year's report) are still in progress, but have not yet reached a definite conclusion. There is one other matter to which I would take this opportunity of referring, though it is not actually concerned with the Committee's report. The Refractory Materials Section of the Ceramic Society, at their meeting last October, appointed a Sub-Committee to draw up standard methods for use in the testing of these materials; and this Sub-Committee presented their report to the May meeting in Sheffield, where it was accepted. I have been asked by the Society to introduce the proposed methods to the Institution; and I have a number of copies of the unrevised proof of the report here, which members interested in the matter can have. Several of the methods are based on those already issued by the Refractory Materials Committee, permission to use which was readily given by them, It is expected that the corrected and revised methods will be published in the next number of the "Journal of the Ceramic Society." There is one other small point. In the copies of the report one of the tables gives analyses of raw materials. These

analytical figures have been put in for the sake of completeness, and to give as much information as possible; but the figures are not yet for publication, because they only give you the results of the first analyses, and the check analyses to be made have not yet been finished.* The final figures may differ slightly from these.

Mr. ALEXANDER WILSON (Glasgow): I also have much pleasure in seconding the motion. After the information given by Dr. Colman, I do not think I need say a great deal; but it must strike one that the amount of work that has already been done only seems to point the way to the great amount of work there is still to do. We have gone along in a very haphazard way in the past. It is a most difficult subject and problem to tackle; but I think we are on the right road now, though it may take a considerable time. We must see from the way in which the work is being done, that it is being carried out in a very capable and methodical manner. We are greatly indebted to Dr. Mellor for the vast amount of work he has put into the subject; and we hope that in the future he will be able to get us on much further than anything that has been attempted in the past. The problem is a difficult one. We all require that the best work should be put into it.

Laying the Foundations.

Mr. J. P. LEATHER (Burnley): There are a few considerations that appeal to me in connection with the work that may be expected from this Committee. The Committee has been in existence for some years now; and it is possible that some may be disappointed because of the absence of anything sensational in their reports. We know the first few years were occupied in what, in connection with building, is known as "clearing the site," before starting the erection, or even laying the foundations, of the building. These foundations are now in progress; and we have to see that they are well and surely laid. Much work is being done; but it is a frequent characteristic of foundations that they do not show a great deal above the surface. The results of this work, to my mind, are of two kinds. First, there is the influence on manufacturers' methods of producing; and, secondly, there is the influence on the users' methods of dealing with the products. The effect on the manufacturers of fire-clay goods is two-fold. First, the study of the raw materials and the goods made therefrom will act as an incitement to more careful and scientific control of works and the choice of raw material. This result is already seen in the fact that more English manufacturerers are employing chemists and scientific control in their works. Secondly, it is possible that the investigations of the Committee may result in such radical changes in the character of the material or in the preparation of it as to produce goods capable of standing a much greater strain in use than has been practicable in the past. I say it is quite possible. While the Committee are on the look out for this, I do not think it is the most important part. What is important is that we should utilize to the best advantage the natural products at our disposal; and this is equally the duty of the user at the gas-works and of the manufacturer. I think there has been too much tendency on the part of some gentlemen to think that this Committee are going to produce some wonderful material that will stand a temperature a thousand degrees higher than in the past, and things of that sort. What we want to see is that we make the best use of the materials we have, whether as manufacturers producing fire-clay goods, or as users on gas-gas-works of what they have produced. The Committee works jointly with the Committee of Fire-Brick Manufacturers; and there is evidently an advantage in this. But if we take it that the only advantage is that we as users should tell the manufacturers what we want, and expect them to do it, we are not only making a great mistake, but acting in an unscientific manner. The investigation will no doubt have its effect on the manufacturer; but the reflex action on the user may be equally important. We see this in the part of the report which Dr. Colman has drawn attention to. A brick may, by its method of use, stand a higher temperature than a superficial reading of the report of its action on test in the laboratory would lead one to expect. The manufacturer, by these reports, has set before him the scientific principles relating to the materials and methods which he will now use to his own advantage, and to ours as well; but we want to study these results also, in order that we may obtain the best effects that are possible from the bricks that are supplied to us by the manufacturer. This means that we need to design our furnaces in such a way as to take account of the properties of the materials that we use. For instance, if we find that pressure strain on a brick lowers the temperature at which the brick will yield, then it is evidently our duty, in designing a furnace, to see if we cannot avoid the coincidence of pressure and high temperature. At the point in the furnace where it is necessary to have a high temperature we want, if possible, to see that no great pressure strain can come on the brickwork. What pressure is inevitable should come on some portion which is not at quite so high a temperature. This is the reason why bricks have stood in the past. For instance, a brick may upon one side of a wall be at so high a temperature that it will not stand so great a pressure; and the other side of the wall, where the temperature is not so high, may be taking the additional pressure strain. The same thing applies to the results of the other investigations, which are not yet completely published. There is the chemical effect of the flue dust. We cannot altogether get rid of flue dust; so it is our duty to see that in our furnaces there is no flue dust where there is a very high temperature. We want to design our furnaces so that the fire-brick manufacturer having done his best, we shall do our best to see that the bricks are properly treated. These researches should be studied carefully to see what the real lesson is that we should draw from them.

"Casting" Retorts.

There is one matter mentioned in the report that I should just like to mention, and that is that the Committee hope very shortly to test a new process of manufacturing retorts. This is the "casting" process. It has been adopted in other lines for producing ceramic ware, but not as yet for gas-retorts to any extent. In order that it shall be properly tried further on a large scale, we desire to have offers from gas-works which will undertake to test these retorts when they are made. We shall need to have the information soon, because the making of the moulds is an important and fairly expensive process; and, of course, the retorts must be as gas engineers want them. We do not want a large number of offers from works, but should like a few; and those who take an interest in testing these retorts might inform me of the sizes and shapes they desire to try.

Mr. SAMUEL GLOVER: Before the discussion of this subject goes any further, I want to safeguard a little more Mr. Leather and the Committee. Mr. Leather has already said that he does not want a whole crowd of offers to test all shapes and sizes of retorts; and I should like to safeguard him from any misconception in the matter of the supply of these pieces of retorts. The word "casting" a retort may not be generally understood; for I confess that when I was first taken with the Committee to see the process of casting —having been used to seeing clay cast in the brickfield, and knowing the method of storing it in such a way that it mellowed—I was a bit astonished to find the word "casting" used in regard to retorts, as we speak of cast iron. It is the moulding of a piece of retort in a mould constructed to exactly the shape of the retort. I suggested to the Committee that they should invite a few of our members who use a standard size of retort to send in offers to test a few lengths of a well-known size, and see in several works what would be the very best way of proceeding. I do desire to safeguard the Committee further than Mr. Leather has done in putting out any expectation to you that you may have all sizes and shapes and lengths of retort cast by this new process, which I think is a very good one to experiment with. Several of the works will be invited to test a standard size and shape of retort when it is made in possibly one mould for the Committee to carry out this very interesting experiment.

The Manufacturers.

Mr. ALBERT CLIFF (being called upon) said: My Lord and gentlemen, I have been rather unexpectedly drawn into this matter, and the ground has been very amply covered; but it is a great pleasure to come here and assure you, on behalf of the manufacturers who are affiliated with the Society of British Gas Industries, that we will give you at all times in these matters our best support. It seems to me there is just one thing that might well be said. It is, that you started your investigations six or eight years ago

* The revised figures have since been received, and are published to-day.—ED. "G.J."

in an atmosphere of almost absolute indifference, and that now, after these years of work, you find a lively thirst for this new knowledge which you then set out to secure. Well, the manufacturers themselves meanwhile have not been at all idle. They have carried the gospel of research into every important seat of manufacture. We are not, I know, faultlessly organized. On the other hand, much has been done to improve the knowledge of men who are now actually working on these goods; and certainly a great deal has been done to ensure that the younger men who are coming on shall be much wiser than we older men are in this particular manufacture. What I feel is that great credit is due to gas engineers, and to manufacturers equally, in this matter—not only for supporting these investigations, but also for the very fine and excellent spirit in which the work has been carried on for several years. ["Hear, hear."]

Salty Coals.

Mr. W. CHANEY (Birmingham): The ground has been so well covered that I am afraid I cannot add much to what has been said. There is, however, one point upon which I should like some information, and that is, the effect of the salt upon the fire-bricks. I know this question has been thoroughly threshed out; but still there is something to my mind that is not quite understood. At Birmingham, we are going in rather extensively for coke-ovens; and the effect of salt on coke-ovens is pretty well known. It has always been contended in the past that the brick containing the highest amount of silica is the most effective brick for high refractory work. Well, perhaps I am going to state something which is against me and against the information, but my experience has been that a brick containing a high percentage of silica is the brick that withstands the salt the least. When I say "the highest amount of silica," I mean bricks containing up to 95 or 98 p.ct. of free silica. We have had several walls in the coke-ovens which have been built of this high silica material. On the other hand, we have had walls which have been built of bricks containing a moderate amount of silica; and the bricks containing a moderate amount of silica—that is about 75 p.ct.—have withstood the salt very much better than the high percentage silica brick. The only reason I can suggest—and perhaps it is a matter that the Refractory Committee can help me upon—is that the high percentage silica brick has a more porous nature, and it helps to absorb the moisture of the salts, which penetrates into the brick, and so causes its destruction. I have been called upon at rather short notice, and have not had an opportunity of reading the report; but I should certainly like to hear what some members of the Committee have to say on this rather important question.

Scrap Old Methods.

Mr. CHARLES CARPENTER, D.Sc. (London): I have only just come into the hall; and I do not know that I really can contribute anything to the discussion, although I appreciate very highly the compliment you pay me in asking me to do so. If I may be pardoned for not speaking directly to the point, I hope I may be allowed to use the report as a text for some other remarks which I think may not be out of place, having regard, primarily, I think I may say, to the magnificent address to which you listened yesterday ["Hear, hear"], and secondly to the basis of the report. I may, again, be out of order; but I should like to pay two tributes, if I may, at the moment. One is to our President. But I hope, in doing so, we shall not forget one other genius to whom is owed the gratitude of our industry—and that is the man into whose head entered the idea of asking his Lordship to be the President of the Institution. When we think of radium, we think of Madame Curie; when we think of Moulton, we must think of that unknown—for I do not know his name. The basis of his Lordship's remarks to you yesterday was that you have to throw over the old methods and the old systems of endeavouring to carry on your business, and to bow, as all other manufacturers have done, to the new methods which must form the basis of industry to-day and in the future. The old method of testing fire-brick was to put a piece into a sight-hole, and after a few days to endeavour to get it out again, and see the condition it was in. This, until comparatively recently, was adopted for ascertaining the refractory character of fire-bricks. It will no longer come up to modern requirements. You have to attack the problem in a scientific manner from the very beginning, and put your material to the strain and stress it will have to stand in the course of its use. That, if I may say so, is the method that has got to be applied not only to fire-bricks. After all, if his arches tumble in and his retorts collapse, it does bring it home to the average gas engineer more than anything else that there is something wrong somewhere. But there are many respects in which I think the gas engineer must look forward further than the matter immediately under his nose. I cannot, however, be blind to the fact that it is the fool of the profession who is now addressing the meeting. I have been trying for years to induce those working for the industry to work for higher standards and higher ideals than those customary. Take sulphate of ammonia. I came to the conclusion that it should possess two characteristics. One was the highest possible purity, and the other was that it should be capable of being used direct by those who bought it for fertilizing, instead of them having to lay it out in a barn and then break it up into small pieces and get it on to the land—that it should be in such a condition that it had a chance to be assimilated in the soil. I was called a fool; and it was pointed out how much money I was losing. But the Sulphate of Ammonia Association, I am glad to say, have now taken up the matter, and set a very high standard. And not only this. We say we want a material that can be exported abroad in such a manner that when it reaches its destination it will not all be found in the bottom of the ship's hold owing to the free sulphuric acid having eaten up the bags. I should like to say, with regard to lighting, I was told by the Governor of the greatest Gas Company that their lighting load had gone. Mine has not gone; and I think very few here to-day would like a state of things where all the lighting load was gone. But what is the position with regard to the method by which gas is converted into lighting units? No one knows better than you, my Lord, because you went all through that remarkable case twenty and more years ago, when the Welsbach Company had to fight for their patents against a lot of infringers who had all sorts of ideas for impregnating mantles—right down to common salt, I believe. You remember the part the late Sir George Livesey took, when it was so important to maintain the quality of the mantles on which the lighting load depended. What is the position to-day of the wonderful bunsen burner, with its delicate mechanism for the mixing of the gas and air? Though essential to success, it is customary not to test in any single way these incandescent gas-burners which are put on the market for the use of consumers. These articles are made by manufacturers, and not tested in any way whatever. They are sent to the gas-works or to the ironmonger without having had a cubic foot of gas put through them. Compare this with what is done in connection with electricity. Competition with electricity is great; but it need not alarm us if our business is carried on in the same scientific manner as that of electric lighting. Their lamps are not only thoroughly supervised in manufacture but are carefully tested and rated before going out. When they are sent out, the consumer can take them, and he knows that he will get the maximum effect from them. That is not the case with gas appliances. I give these as examples—though I know they have nothing to do with the report before the meeting—of the great importance of this industry taking as its basis what you, my Lord, so urgently pointed out yesterday—the scrapping of all their old methods and ideas of doing work. There is the gas made per ton. I have sat down with a Board of Directors, who have said: "Another 150 or 200 c.ft. per ton beyond what was made last year!" It does not mean this equivalent of additional heat units at all. It probably means he put on his exhauster and drew in more air. [A VOICE: Not necessarily.] Not necessarily; but we do not want to talk after the fashion of selling a "bundle of firewood"—which has not the same number of sticks in as before the war. We want to maintain the quality of our article; and we shall not do this by speaking of the number of cubic feet per ton. If we turn out a standard make of gas, and express it as so many thermal units, we shall get on; but as long as we speak of so many cubic feet of gas per ton, without saying what it is, we shall not get on. I do know enough about the work that has been done in the matter of these researches into refractory materials to say that it is in most admirable hands, and the problem has been tackled in a thoroughly efficient manner. On some earlier occasion, I suggested that we might take a leaf out of the books of those who have now become our enemies, and endeavour to

put our manufacture of refractory materials on a scientific basis. I am glad this is being done, and that it is now possible to make British retorts which, as far as can be said, will stand a chance of being practically as good as the German. Whether they will be better, I do not know; but to get anything like the quality of the German retort is, I think, a tremendous step in advance for our industry. I apologize for these discursive remarks; and I do hope the address will be read, marked, learned, and inwardly digested, in the very utmost degree, and put in the hands of all those—directors, secretaries, &c.—who are concerned in the management of the gas undertakings of the kingdom.

Mr. SAMUEL GLOVER: I should like to know if there is any further discussion on this subject. We should be very glad to hear other remarks from members.

Sympathy with the Problem.

The PRESIDENT: I have listened with very great interest to the discussion; and I have read with similar interest the report. Now, the report deals with things germane to your life and foreign to mine; but in whatever I have had to do with in life I have felt this—that you can enlist men's minds in a subject, not by elaborate teaching of detail which must ultimately be the valuable outcome of the research, but by getting them in sympathy with the problem and the fundamental ideas that underlie it. I cannot help thinking that all of you may grow to take a keener interest in the methods and the work of the Committee who are doing such valuable service if you will read through their report with the aim, as it were, of appreciating the enemies they are fighting and the problems for which they are seeking a solution. I have got before me a portion of the report in which there is a general conclusion put forward for consideration. Fire-bricks seem to have two forms of collapse—one a fusion collapse, where they gradually give way as the temperature rises, and the other a mechanical collapse, which seems that they have stood it up to the final point, and then gave way altogether. Does not that bring forcibly to our minds the double nature of the question of refractory materials? You see, in raising materials to a very high temperature, you are testing them in two ways. If a fire-brick were absolutely homogeneous, made of one substance alone, there would be a temperature which it would not stand; and you know that this might be preceded to a certain extent by the plasticity which warns you that you cannot put it under the strains it used to bear, and which may lead to sudden collapse. But that is not the only test—the only strain—that you are putting your fire-bricks to. As temperature rises, you get into the region in which chemical action is possible—chemical action which has nothing to do with the qualities of the independent materials, but with the compounds which at the temperature can commence to form, and the behaviour of which depends on the physical peculiarities of the compound, and not of the individual. Now, it seems to me that, in reading the portion of the report to which I refer—though I do not pretend to say that either of the types of collapse corresponds with the extreme case—but knowing the mechanical action and knowing the chemical action, it does seem to me that it brings us into sympathy with the double enigma that has to be solved by the people who are investigating the behaviour of refractory materials. Now, if you get these two ideas into your head, you do not forget them. You do not have to say: "What was the figure in the ninth column of such and such a table," because they live in your minds as ideas. And I cannot help thinking that if you read the reports more with the view of seeing the scientific mysteries which are being solved than with the idea of keeping up with the research as if the responsibility was on your own shoulders, you will feel a keener sympathy with the people who are doing your work in this respect—who are facing the difficulties. You will appreciate more the ability with which they are designing the tests to which they are putting the materials, and you will be more willing to assist them in the very valuable way which has been referred to in the debate—that is to say, you will be willing to test in practice that which their experiments have shown is worth investigating. I do not pretend to be able to solve—or to help to solve—these puzzles; but I do feel I can tell you from my experience of thought in general that it is always wise to get into sympathy with the nature of the problem, because you will then best understand the manœuvres of the battle by which the foe is conquered. If you do not know what is being done, what is the aim, where the strong points of the mystery are, it is just like looking on a battle where you do not know the position of the foe, and it seems to be a helpless and hopeless confusion. With these ideas in your mind, I am not afraid but that you will heartily support and energetically assist those who are doing their best to help you.

Dr. Colman Replies.

Dr. COLMAN: I think there is very little that it is necessary for me to say after the discussion that has taken place. I should like to express my gratitude to his Lordship for the remarks he has made, with which I think the members of the Committee will feel in very deep sympathy. I believe everybody who has come on to this Committee, after a little work, begins to understand the complexity and the difficulty of the problem a great deal better than he did before; and we feel very much, with his Lordship, that a study of all the work that is being done, and all the conditions under which the work is being done, will help one to realize a great deal better what has got to be done in the future, and which must be done if we are to progress as we ought to do. The only other point, I think, is that of Mr. Chaney, who raised the very important matter of the effect of salty coals upon fire-clay. This is a subject which has been on the list of the Refractory Materials Committee for, I believe, six years past; but our capacity for getting work done—especially under present conditions—is, as you know, limited. Up to the present, therefore, it has not been possible to do anything towards solving this important problem. May the time come soon when we shall have more assistance, and more cash to carry out experiments, so that we may get this matter moving to the extent to which it ought to move in the future.

The report was then adopted.

Composition of Gas and Coal Conservation.

Mr. H. KENDRICK (Stretford): Before you proceed to the next business, there are two questions which I should like to be allowed to put. During the last two days, a considerable number of questions have been asked as to what is being done in regard to two matters the Council have in hand. They are in some way related. I think, at any rate, they may prove to be related, if the Council go further into them. One has reference to the composition of gas, and the other to coal conservation. I am aware a voluminous interim report has been presented to the Council containing valuable information as to the results of experiments that have been carried out; but a considerable number of members have expressed themselves as desirous of having some little information, however vague, that will enable them to see how far these experiments have been taken. Then in regard to the other matter. A question has been asked as to what has been done to present to the Reconstruction Committee our proposals for the conservation of coal. It is said that we should present our case rather than rely upon the destructive criticism of the electrical report. Alarm has been expressed on many occasions by our members at the financial assistance that has been rendered by the Government Departments, as shown by the answers to questions in Parliament. I think the members would welcome a little information on these two points, if some members of the Committee who have the matters in hand could give it to them.

Mr. SAMUEL GLOVER: Both the points raised by Mr. Kendrick are of sufficient importance to awaken interest; and the Council really take it as a compliment to the earnest purpose with which they have examined the two subjects, that they should be inquired about. We like to see the interest which makes inquiries come along. You will be glad to know that the investigation as to the composition of gas in the future, which is one of the most important subjects immediately confronting the gas industry, is considered to be of such importance as to justify further work on it, notwithstanding the production already of a preliminary voluminous report. I shall not be letting any secrets out of the bag if I say that it will possibly be necessary in a short time to call a special session of the Institution to consider both the preliminary and the further report that is being prepared on the subject. [Applause.] I think the members quite appreciate the position, by the applause which indicates their support of us in our investigations. With regard to the very lengthy report on electricity concerns which has been presented, and supported in a measure

by figures which are in some cases absolutely fictitious and imaginary, we are preparing a report which we consider, in our interests and in the interests of the industry, should be presented, on the national work which is being done in the conservation, in the greatest possible sense, of the energy of every ton of coal which goes into a gas-works. We shall possibly submit the report to you at the further gathering of the Institution we purpose calling.

The New Officers.

The President: The Scrutineers' report on the ballot for office-bearers for the ensuing year is as follows:

President.—Mr. Samuel Glover, of St. Helens.
Vice-Presidents.—Mr. Thomas Goulden, of London (in place of Mr. Thomas Berridge, who has resigned), and Mr. Thomas Hardie, of Newcastle-on-Tyne.
Ordinary Members of Council.—Mr. Henry D. Madden, of Cardiff; Mr. Samuel Tagg, of Preston; Mr. John Terrace, of Grimsby; and Mr. Chas. Wood, of Bradford.
Auditors.—Mr. S. Y. Shoubridge and Mr. E. W. Drew.
Hon. Secretary.—Mr. W. E. Price, of Hampton Wick.

New Members and Associates.

The following are the new members and associates elected:

Members.

Bradshaw, J. R., Retford.
Burgess, Captain Henry, R.A.F., Sidmouth.
Cattle, J. B., Dartmouth.
Cheal, A. G., Crowborough.
Dawson, C. G., Paignton.
Dumbleton, H., Dublin.
Fenwick, G., Yeovil.
Gregory, A., Whitwell.
Grey, A. W., Seaford.
Lacey, S., London.
M'Lusky, J. W., Blackburn.
Muir, R., Galston.
Noble, J. H., Chester.
Offord, G. C., Petersfield.
Pickering, W. J., Birmingham.
Robertson, R., Bristol.
Shewring, F., Tawe Valley.
Smith, J. M., Stirling.
Sowerbutts, W. S., Stockport.
Tucker, W. P., Wokingham.
Wyver, C., Denbigh.

Associate Members.

Belton, F. W. J., Macclesfield.
Chandler, S. B., London.
Clarke, J. H., Whaley Bridge.
Gandon, K. R., Bath.
Joyce, J. T., Ilford.
Muir, D., Grays.
Richardson, A. H., Tottenham.
Scaife, F. L., Stockton-on-Tees.
Shenton, G. H., Rainford.

Honorary Members.

The President: I now have to move the election of certain honorary members—the Presidents of Gas Institutions of Allies. But before doing this, I should like to refer to a telegram which I received yesterday, but too late for the meeting, from the President of the Société Technique de l'Industrie du Gaz en France, of which the following is a translation:

> **In the name of the Société de l'Industrie du Gaz en France, I have the honour to transmit to the distinguished President of the Institution of Gas Engineers, and to all of our English colleagues, the expression of our best wishes for the success of the meeting of the Institution and the assurance of our cordial friendship.**

I propose, with your authorization, to send in reply to M. Rouland, the President of the Société Technique:

> **We appreciate very deeply your most cordial telegram; and the members of the Institution of Gas Engineers actually in conference beg you to transmit to the Société Technique de l'Industrie du Gaz en France their fraternal greetings, and tender to you, their illustrious President, their respectful homage.**

I think by your applause that this has your approval. The honorary members whose election I propose are—

> **The President of the Société Technique de l'Industrie du Gaz en France.**
> **The President of the Itallan Gas and Water Society.**
> **The President of the American Gas Association.**

Mr. Samuel Glover: I second that. It has been ou practice to elect the President of the Société Technique an honorary member; and now we have added two other Allies—the Italian and the American Associations.

Place of Next Meeting.

Mr. Samuel Glover: My Chairman is with me this morning; and I should like to ask his permission to accept the office of President, seeing I am continuing in office at St. Helens.

Alderman Crooks (St. Helens): As one who has known Mr. Glover since boyhood, I am delighted to know that he has been elected President of the Institution; and I am perfectly sure that he will fill the position with credit to himself and satisfaction to the members. It is not only an honour to Mr. Glover, but to the town of which he has been Gas Engineer for forty years. On behalf of the St. Helens Gas Committee, I thank you sincerely.

Mr. Samuel Glover: Then I accept office on the condition that you will be as good to me in the future as you have been in the past. As to my association with St. Helens, I have been connected with the undertaking as pupil, assistant, deputy, and engineer for upwards of 45 years, and have been supported by one of the best Committees that any man could have been associated with. I shall, as your President, have the honour of being associated with the French and Italian Societies. I remember visiting one of the old works in the beautiful City of Venice, which God grant the enemy may not further damage. ["Hear, hear."] I have seen labourers, stripped almost naked, carrying coal from the barge on the canal into the gas-works, in the heat of an Italian sun; and in another part of the city I at the same time saw a staff of engineers working out on model lines a new gas-works, which I hope to have the privilege of seeing later on. It will also be an honour to be associated with the American Institution. As to the place of meeting. Notwithstanding that we have at St. Helens some of the largest and best things in the world, the town is not large enough to accommodate the Institution of Gas Engineers. I propose, therefore, that the meeting be held in London next year.

Mr. C. E. Jones (London): I should like to second the motion. If not absolutely essential, it is at any rate highly desirable, during this horrible war, that we should meet in the Metropolis, where there is every accommodation. This theatre is admirably adapted to the purpose of the meeting; and I am glad to see in it one of the greatest scientists. I am sure that his address will be a gem in the literature of our Institution.

The proposal was carried unanimously.

The President: I feel that I should apologize to my successor for not realizing that I ought to have given him an opportunity of saying whether he would or would not accept the position; but if we are in the Palace of Truth, and to say what I really feel, I can assure you that I had no anxiety about it at all. One does not refuse such an honour as this; and even when he said he must appeal to the Chairman of his Committee (fortunately present), I did not tremble. It sounded to me so much like the "Ask Papa;" and I knew that "Papa" was generally prepared. [Laughter.]

Votes of Thanks.

Mr. Samuel Glover: I have to propose that the thanks of the Institution be given to Lord Moulton for his presidency during the past year. I know I have your hearty support in expressing these thanks. I have been brought into intimate contact with his Lordship, who told me that I was to consider that he was at our service at any time that I might call upon him; and this arrangement has been carried out most readily during the year. He has helped us in every possible way.

Mr. John Young (Hull): I am pleased to second the motion. Those who have been more closely connected with Lord Moulton in the management of the Institution during the past year have invariably experienced that kindly courtesy for which he has always been noted. The keen interest

he has manifested in the welfare of the Institution culminated in that inspiring and inspiriting address to which we listened with such great interest.

The vote having been carried with applause,

The PRESIDENT said: I feel that the whole of the thanks should come from me to you, for the honour you have done me. That I have told you already. But you have not only done me an honour—you have done me a great service; for you have brought me into far closer contact with the great gas industry, and made me realize far more vividly than I had ever done its services, its duties, and its difficulties.

"I Shall not Forget."

Now, I think you may rely upon it that what I have learnt I shall not forget; and if in any way I can assist you, either in your difficulties, your duties, or your services—whether in making them light to yourselves or in bringing you or others to realize their true magnitude—I shall be sure and certain to do it. You have got in your hands an industry that can be of the greatest possible value to the nation; and, on the other hand, one that might be allowed to become almost a drag upon it, if you were untrue to your industry, and were to permit yourselves to fall back into that state of atrophy that I warned you yesterday might come over industries the members of which were not eager and efficient. But I have no fear, from what I have seen of you, that anything like that is to occur. Remember that the best way to defend yourselves is to make advances. That is the lesson which this war is teaching us—that the "resting where you are" is equivalent to falling back. I take leave of you as President full of hope, and at the same time deeply impressed. Young and old alike among you must feel that it is a disgrace if you are not marching forward. You must take an interest in everything that tends to make your industry more efficient, because you want to win not only economic success, but you want to win for your industry the appreciation of the whole country. I am sure you are determined to do this; and you have my best wishes. [Applause.]

Mr. S. Y. SHOUBRIDGE (Lower Sydenham): The Institution have now for many years enjoyed the hospitality of the Institution of Civil Engineers; and I ask you to express to them your gratitude and thanks for their courtesy to us.

Mr. W. N. WESTLAKE (Exeter) seconded the proposition, which was cordially agreed to.

The Work of the Council.

Mr. ROBERT WATSON (Doncaster): I have to propose that our very hearty thanks be given to the Council for the work they have done during the past year. We all of us know the constitution and the character of the members of the Council; and this knowledge is of itself sufficient guarantee that they have entered into their work with great heartiness, keen interest, and very considerable ability. The report that they have presented to us at this meeting has been short; but it affords no indication, one can easily believe, of the extent and character of the work that they have done during the past year. One only has to turn to the vanishing of the special purposes fund to note that some dozen or fifteen subjects have been treated; and we have had an intimation in the remarks made by the new President that, even as their year terminates, they have been interested in preparing a report of the Institution on coal conservation. I am glad to know from the report that the Government have acknowledged the work done by the Council on behalf of the Institution—an appreciation one could have wished had in some respects been more tangible. ["Hear, hear."] The work that the Council have had to do has been considerable, although it has been to a very great extent relieved by the new activities taken over by the National Gas Council. They are to be congratulated upon having been under the stimulating influence of our late President, Lord Moulton. The remarks in his address, and on the motions during the meeting, indicate to us that the Council must have had considerable appreciative help from his Lordship at their meetings.

Gas-Meters Research.

I wished yesterday to refer to one matter in the report; and, if I may do so, I will take the opportunity now. I stated a moment or two ago that the report was short; and probably one subject they have not dealt with so fully as some would have desired is the question of the life of gas-meters. I should like to suggest to those members who still continue, and those who are newly elected, that, though they may be exceedingly busy, this is an opportune time—when gas is being stripped, and when blue water gas is being added to coal gas in further large quantities—to have investigations made as to the effect on the gas-meters and their diaphragms. I am sure the District Associations would be very happy indeed to help them by doing work in different areas on this particular subject. The other part of my proposal refers to our very worthy and well-esteemed friend, Mr. Price, our Hon. Secretary. We have most of us known him for very many years, and have always had from him courtesy combined with willingness to give information whenever desired. Our hearty thanks are due to him.

Mr. W. CHANEY (Birmingham) seconded the proposition, which was heartily carried.

Mr. SAMUEL GLOVER: On behalf of the Council, I thank you. In answer to Mr. Watson, I would like to say that all the points he has mentioned shall receive our very earnest consideration. I feel that the Life of Gas-Meters Committee are doing very important work for the industry. We ought to consider standards for the future more applicable to modern gas-works requirements and meters. For instance, we should no longer speak of meters as of so many lights. What sensible meaning does it really convey to anybody in these days? We might also possibly re-consider the number of sizes of meters, and generally their capacity—including the method of registering the revolutions of the index mechanism.

Mr. W. E. PRICE (Hampton Wick): I thank you very heartily for the kind words that have been expressed, and the appreciation shown by the members. It has been suggested to-day that we should all be going forward, and not standing still. I do not think there are many of us who have had the desire to stand still; but if there should have been at the back of any of our minds that feeling of lassitude which perhaps is more to be excused after the three or four strenuous years which we have experienced, we shall be more invigorated to-day, after the inspiring and inspiriting address which we have had from his Lordship.

Mr. S. J. INGRAM (Truro): I have to propose a vote of thanks to the members of the various Research Committees, the Scrutineers, and the Auditors for their very valuable services during the past year.

Mr. GEORGE CLARRY (Cardiff) said: In seconding this, I would especially commend to your notice the work done by the Refractory Materials Committee. As the proceedings of this Committee are brought forward year after year, they become of greater interest and value to the industry.

After the vote had been carried,

Dr. HAROLD G. COLMAN (London) said: I have been asked to express the thanks of the members of the various Research Committees for this kind vote. While we appreciate the remarks very much, I think at the back of most of our minds the bigger feeling at the present time is one of regret that we have been unable to do more than we have done. We hope that the time may shortly come when we shall be in a position to devote more attention to these matters, which are very near our hearts, than is possible at the present time.

The PRESIDENT: That, gentlemen, closes the business to-day; and I have only to wish you "Good-bye."

The Constitution of Coal.—Early last year papers were read before the London Section of the Society of Chemical Industry by Dr. Marie Stopes, on "The Palæobotany of Coal," and by Dr. R. V. Wheeler, on "The Constitution of Coal." As these papers contained records of work of first-class importance, and the subjects dealt with are of the highest value from both the scientific and economic standpoints, the authors (on the suggestion of the Committee of the Section) jointly undertook the amplification of the papers, with the result that a monograph on the whole subject has been prepared. The Council of the Society—considering the publication of this monograph to be a matter of national importance—approached the Department of Scientific and Industrial Research, with the result that the mongraph has now been printed and published by H.M. Stationery Office.

ORDER OF THE BRITISH EMPIRE.

New Appointments.

On the occasion of his Birthday, His Majesty the King has given orders for a large number of promotions in, and appointments to, the Most Excellent Order of the British Empire, for services in connection with the war. Among them it is gratifying to the gas industry to note the inclusion of the following names.

To be Commanders—C.B.E.

Mr. HAROLD B. DIXON, F.R.S., Professor of Chemistry, Manchester University.

Mr. E. SHRAPNELL SHRAPNELL-SMITH, Chairman of the Standing Joint Committee of Mechanical Road Transport Associations, and Chief Economy Officer of the Petroleum Executive.

Mr. CHARLES H. WORDINGHAM, President of the Institution of Electrical Engineers, and Director of Electrical Engineering, Admiralty.

To be Officers—O.B.E.

Mr. JOHN BOND, Engineer of the Southport Gas-Works, and Inspector for Gas Section, Explosives Supply Department, Ministry of Munitions.

Mr. JOHN WILKINSON, Engineer and Manager of the Nottingham Corporation Gas-Works.

To be Members—M.B.E.

Mr. EDWARD V. EVANS, Chief Chemist to the South Metropolitan Gas Company.

Mr. GUSTAV O. H. HORSTMANN, Managing Director of the Horstmann Gear Company, Ltd.

Mr. ARTHUR T. KENT, Engineer to the Woodall-Duckham Vertical Retort and Oven Construction Company, Ltd.

Mr. LOUIS F. TOOTH, Superintendent of the Meter Department, Commercial Gas Company.

JOHN BOND.

Mr. John Bond, who has been Engineer of the Southport Corporation Gas-Works since 1905, was, shortly after the outbreak of war, appointed a member of Lord Moulton's Committee and obtained for the Explosives Department of the Ministry of Munitions of War increased quantities of the products essential in the manufacture of high explosives. To further assist in procuring products in this direction, Mr. Bond designed and built a debenzolizing plant, which was erected at the Southport Gas-Works from material usually found on such a works; and this has operated most successfully. It has also been adopted by a number of gas undertakings in Great Britain and abroad. The idea was freely given by Mr. Bond to gas undertakings who wished to adopt the plant. In connection with Mr. Bond's work for the Ministry of Munitions, Lord Moulton, on his election as President of the Institution of Gas Engineers last year, in the course of a high tribute to the members of the gas engineering profession, stated that, without the direct aid of the gas industry, and, further than that, the assistance of, and the knowledge which had been acquired by, those who had devoted their lives to it, it would have been perfectly impossible for this country to have waged the campaigns of the last three years, or even, for any but a trifling time, to have resisted the overwhelming flood of enemies that was poured upon it. In addition to Mr. Bond's work in regard to the manufacture of high explosives, Sir Arthur Churchman, the Controller of the Mineral Oil Production Department, some time ago appointed Mr. Bond a member of the Advisory Committee to assist the department in procuring and producing fuel oil for the navy; and Mr. Bond has been, and is still, doing a great amount of work in this particular task.

Mr. Bond started his career at the Nottingham Gas-Works as a chemical assistant, and for a time was engaged in special investigations in chemical and engineering problems. Afterwards he was appointed Analyst to the Bristol Gas Company, and later obtained the position of Analyst and Assistant to the Salford Corporation gas undertaking. Subsequently for a number of years he held the position of Manager to the New Wortley Gas-Works, Leeds. As already stated, in 1905 Mr. Bond was appointed Engineer and Manager at Southport; and the progress of the works since then is perhaps the best tribute to his worth. They have been practically re-modelled, and are now among the best in the country; while the profits have enabled the Corporation for some years to keep the town going on a low rate. Among other work, Mr. Bond has specialized in the carbonization of coal; and in 1906 he read a paper before the Institution of Gas Engineers on "Pyrometers and Carbonization." He was one of the first to emphasize the importance of adopting pyrometrical work in connection with gas manufacture. For this paper, he received one of the Institution's medals. In 1914, he was elected to the office of President of the Institution, after having served on the Council for a period of seven years; and it was the large amount of work he had undertaken for the Government, coupled with his own duties at Southport, that prevented him continuing in office for a further term.

NATIONAL GAS COUNCIL OF GREAT BRITAIN AND IRELAND.

Half-Yearly Report of the Executive Committee.

A MEETING of the National Gas Council was held last Thursday afternoon, in the Central Hall, Westminster, to consider the half-yearly report of the Executive Committee. Mr. HARRY E. JONES presided. Many of the items in the report were included in that made to the General Consultative Committee last February; and as these items were given in the "JOURNAL" at the time [see the issue dated Feb. 26, p. 392], there is no need to reproduce them now. The portions in last week's report which were not so included will be found below.

REPORT OF THE EXECUTIVE COMMITTEE.

[Portions not included here will be found in the "JOURNAL" for Feb. 26 last, pp. 392-3.]

COAL.

Price of Coal (Limitation) Act.—The Wales and Monmouthshire District Institution of Gas Engineers and Managers sent a deputation to the Controller of Coal Mines on Jan. 15 last, to urge the removal of the extra 2s. 6d. per ton on the price of coal in the districts of South Wales and Monmouthshire and the Forest of Dean, imposed by the Board of Trade in June, 1916, under the Price of Coal (Limitation) Act, 1915. The application of the Institution was supported by Members of Parliament; and several instances were quoted of hardships suffered by gas undertakings as a consequence of the imposition, especially in view of the poor value of the coal for gas-making. The Controller of Coal Mines promised to report the views of the deputation to the President of the Board of Trade. The Board expressed its inability to alter the price, and referred the Wales and Monmouthshire Institution to the application of gas undertakings in connection with financial hardships brought about by war conditions, which was being considered by the Board of Trade.

Stocks of Coal.—Resolutions from the various Associations, and from a number of gas undertakings, were received, reporting the serious position arising in many gas-works through short deliveries of coal and the inability to obtain delivery of arrears, notwithstanding the existence in several towns of large stocks of coal for domestic purposes. This matter was taken up immediately with the Controller of Coal Mines, who stated that he would give the matter special attention.

Diversion of Household Coal to Gas-Works.—It was suggested to the Controller of Coal Mines that a proportion of household coal should be diverted to gas-works, in order that the valuable bye-products might be extracted, that an appeal should be made to coal users to substitute gas or coke wherever possible, and that coke should be used for household purposes as much as possible in the districts where it is produced, in order to save transport and to leave more coal to be dealt with by gas undertakings.

GAS.

Gas (Standard of Calorific Power) Act, 1916.—It was recommended to the Council by Councillor F. J. West that a Bill should be promoted in Parliament to provide for all gas companies working to a calorific instead of an illuminating power standard. Such procedure was considered inadvisable at the time, in view of the investigations which are being carried out by the Fuel Research Board; and it was pointed out that individual companies could secure the necessary alteration upon application to the Board of Trade for an Order under the Gas (Standard of Calorific Power) Act, 1916.

In this connection, it is regrettable that, in spite of the decision of the Ministry of Munitions that gas undertakings providing the Government with material for high explosives should not be penalized for calorific deficiency in gas supplied by them, a prosecution of the Portsea Island Gaslight and Coke Company on such grounds has taken place. The Council made a strong protest to the Ministry of Munitions; and an Order has now been issued under the Defence of the Realm Regulations imposing an obligation upon gas undertakings to carry out the orders of the Government in regard to the stripping of their gas, notwithstanding their statutory obligations, which should render a recurrence of such prosecution impossible.

Government Pressure on Manufacturers to use Electricity for Power.—The notice of the Council was called to the case of a gas undertaking, one of whose consumers (a munition works) was being pressed, it is alleged, by a Government Department to substitute electrical for gas power plant in their factory—in spite of the fact that to do so would necessitate the laying of a very long electric cable expressly for the purpose, while a new gas-main into the works has recently been laid, capable of supplying all the gas required. The Council have approached the Department concerned on the matter, and have asked that pressure of such a nature shall not be further used to the prejudice of gas undertakings.

LABOUR.

Schedule of Protected Occupations.—The revised Schedule of Protected Occupations issued on Feb. 1 last indicates that the

Government authorities fully realized the necessity for adequate protection being afforded to the industry at that time.

With regard to the recent extension of the military age, instructions have been issued by the Ministry of National Service that it is not proposed at the present time to call up for service men of the new military age who are registered as being engaged in gas undertakings. The Ministry, however, express the hope that gas undertakings will make every endeavour to spare additional fit men for military service, or for work in munition factories, for which only men are suited, by the increased employment of women.

The Council have received applications in connection with workers employed by outside firms having contracts with gas companies for the erection and maintenance of plant; the Ministry of Munitions having contended that these men are not protected under the Schedule. The Council have taken up the matter with the Ministry of Munitions; pointing out that such a reading of the regulations would have a very serious effect upon the industry generally.

Dilution of Labour in Meter Works.—In March last the Council were approached by the Gas-Meter Makers with regard to the difficulty they were experiencing in carrying out the repair and maintenance of meters for gas undertakings in the United Kingdom, owing to the Union declining to admit the principle of dilution in the workshops, either by women or by discharged and disabled sailors and soldiers. The opinion of several important gas undertakings was obtained in support of this application; and the Council were advised to take up the matter with the Government. The Council regret to report that up to the present they have not been able to obtain assistance in their efforts to arrive at a satisfactory settlement.

Residual Products.

Sulphuric Acid.—A report of the Departmental Committee for the consideration of the post-war position of the sulphuric acid and fertilizer trade, under the presidency of Mr. Edward Shortt, K.C., M.P., has been received. Arising out of this report, the Council were requested by the Association of British Chemical Manufacturers to nominate representatives to serve on the Organizing Committee of a proposed National Sulphuric Acid Manufacturers' Association. The Chairman of the Executive Committee and Alderman William Kay have been nominated to act for the Council.

Sulphate of Ammonia.—The Sulphate of Ammonia Association asked the Council to collect from certain gas undertakings statistics of the cost of production of sulphate of ammonia which were required for the purpose of preparing a memorandum for the use of the Food Production Department and the Ministry of Munitions in connection with the price to be fixed for sulphate of ammonia for the season June, 1918 to May, 1919. The statistics were secured and duly forwarded. Subsequently it was learned that the Government had agreed to fix an enhanced price for sulphate of ammonia (£17 7s. 6d. per ton), and approved a scheme by which the future price of sulphate of ammonia should advance 11d. for every 1s. increase in the price of sulphuric acid, *plus* any rise in the price of bags over 1s. 3½d. each.

Sale of Tar to Distillers.—The proposed scheme for the sale of tar by producers to distillers was agreed, so far as the scale for determining the price is concerned, between the Sub-Committees appointed by the two parties; but difficulties have arisen. The District Gas Institutions and Associations of Engineers and Managers have been requested to nominate representatives to form a Sub-Committee to take up the negotiations with the distillers, and to report to the full Committee of the Council in due course.

Dehydrated Tar for Road Purposes.—The Committee communicated with the Ministry of Munitions regarding this matter, and were informed that the quantity of tar available for road-making was under discussion by the Government Departments. The Road Board would decide which roads are most urgently in need of the tar.

The Council are advised that permits are now being issued in various parts of the country—a considerable quantity of tar being affected. From other parts of the country, information received shows that some gas undertakings are suffering loss of revenue through the closing-down of dehydrating plants. On behalf of such undertakings, the Council appealed to the Ministry of Munitions for a subsidy; but this application met with no success. Inquiries have been sent out in order to ascertain the correct position throughout the country; and if hardship is proved, the matter will be taken up again with the Ministry of Munitions.

Guarantee for Gas-Meters.

In the report submitted to the Council on Oct. 30 last, it was reported that a Sub-Committee of the Council had conferred with the Life of Gas-Meters Committee of the Institution of Gas Engineers on the question of the proposal of the meter makers to reduce the term of guarantee for meters from five to two years. The Committee of the Institution of Gas Engineers subsequently submitted proposed draft standard guarantee clauses for contracts for dry meters, which provide for the term of guarantee remaining at five years, subject to certain conditions. The draft clauses have been accepted by the Council as satisfactory, and are recommended to the industry for general adoption.

Financial Hardships.

Twenty-four Bills of gas undertakings are now before Parliament; and the Gas Bills (Financial Hardships) Committee has been formed by the promoters for the purpose of conducting the general case in support of the Bills.

On March 20 the President of the Board of Trade made a statement in the House of Commons, in which he suggested the appointment of a Select Committee to consider whether any temporary modification of the existing statutory requirements regarding price and dividend, or any other form of relief, should be afforded in the case of undertakings whose financial circumstances had been, or may be, injuriously affected by causes arising out of the war. The second reading of the Bills was consequently postponed until the Select Committee presents its report.

The Select Committee, under the Chairmanship of Sir William Middlebrook, has heard witnesses on behalf of Provincial and Metropolitan gas undertakings, and on behalf of opposing local authorities. The Chairman of the Executive Committee, in his evidence, stated that municipal gas undertakings, as well as gas companies, were in accord with the proposals for applying to Parliament for financial relief.

Should the Select Committee decide that a case has been made out for granting financial relief to gas undertakings, it is hoped that some central form of procedure may be set up, under which undertakings suffering hardship may obtain relief.

Scottish Gas Council.

In response to the request of the Executive Committee, that the Scottish Gas Council should nominate two of their members for co-option to the Executive, in order that co-operation between the two Councils might be more readily attained, the Scottish Council nominated, and the Executive have co-opted, Mr. Lawrence Hislop, of Uddingston, and Mr. J. W. Napier, of Alloa.

Industrial Reconstruction Council.

The Executive Committee have had before them the rules of the Industrial Reconstruction Council, which they have been requested to join; but they decided to take no steps in this direction at the present time. It is proposed, however, to watch the progress of the movement on behalf of the industry.

Federation of British Industries.

At a meeting of the General Consultative Committee held on Tuesday, Feb. 19, the question of the Council joining the Federation of British Industries was discussed, and it was resolved to apply for membership. Application was made, and membership took effect as from April 1 last.

The Executive Committee decided to appoint one member from each of the four constituent bodies to represent the Council on the Sub-Group Committee of the Federation. The following gentlemen have agreed to act on this Committee:

Mr. A. E. Broadberry. .	Institution of Gas Engineers.
Mr. F. W. Goodenough .	British Commercial Gas Association.
Mr. A. A. Johnston . .	Gas Companies' Protection Association.
Mr. A. P. Main	Society of British Gas Industries.

The Chairman of the Executive Committee, Mr. D. Milne Watson, will also act as the representative of the Council on the Executive Committee of the Federation.

The Federation is constituted of members representing both Trade Associations and individual firms. Its objects are:

(1) To provide a body to represent the combined interests of British manufacturers and producers.

(2) To ensure united action by manufacturers and producers, both now and after the war, in developing national industries.

(3) To deal with the urgent problems and difficulties caused by the war.

(4) To ensure that the interests of the manufacturers shall receive proper consideration from the Government and from Government Departments.

(5) To promote Overseas Trade, and to safeguard the interests of British manufacturers abroad.

The Federation bring before the attention of the Government the views of manufacturers on many important matters; among these being the improvement of Commercial and Industrial education.

Members of the Federation have been appointed on several Government Committees; and close touch is kept with the Government on matters which affect the general interests of every manufacturer in the country.

The Federation are in a position to follow the developments throughout the various industries of the country; and it will be most advantageous for the gas industry to keep itself informed of these movements, especially during the reconstruction period.

Finance:

Income.

The income of the Council for the period Nov. 1, 1917, to date amounts to £943 12s., subscribed as follows:

	£	s.	d.
Institution of Gas Engineers	100	0	0
British Commercial Gas Association. . .	600	0	0
Gas Companies' Protection Association .	100	0	0
Society of British Gas Industries	100	0	0
Sundry subscriptions from gas undertakings	43	12	0
	£943	12	0

Expenditure.

The expenditure by the Executive Committee from Nov. 1 last to date is:

	£	s.	d.
Deficit at Oct. 31, 1917	124	14	0
Stationery and printing	148	15	1
Petty cash and postage	164	12	2
Federation of British Industries (subscription to June 30, 1918)	25	0	0
Secretary's salary and clerical assistance	178	17	5
Balance in hand	301	13	4
	£943	12	0
Accounts due, but not yet passed for payment	£179	5	11

In the annual report of the Council made on Oct. 31 last, it was pointed out that the subscriptions of £400 from the four constituent bodies would be obviously insufficient to meet the expenditure in the ensuing year. The British Commercial Gas Association kindly offered to provide further funds; and the Council have been glad to avail themselves of this offer. It will be observed that subscriptions have been received from certain gas undertakings towards the funds of the Council. Individual appreciation and support of this nature is very gratifying.

The Committee regret to report the loss the Council have sustained by the death of Sir Joseph Bellamy, Chairman of the Plymouth and Stonehouse Gas Light and Coke Company; Mr. William Hardie, Engineer and Manager of the Tynemouth Gas Company; Mr. F. W. Stevenson, Engineer and General Manager of the Coventry Corporation Gas Department; and Sir W. H. Stephenson, Chairman of the Newcastle-upon-Tyne and Gateshead Gas Company.

The Council also regret to announce the resignation of Mr. Charles Carpenter, D.Sc., and of Captain R. S. Hilton, who has accepted a position with the Metropolitan Carriage, Wagon, and Finance Company, Ltd.

It becomes necessary to elect another Trustee in place of the late Sir Joseph Bellamy.

The CHAIRMAN, in opening the proceedings, remarked that there were a few outstanding features in the report; and he would call upon the worthy Chairman of the Executive Committee, Mr. D. Milne Watson, to explain them. He would not quite like to say that there were "a thousand-and-one" headings in the report; but there were a good many, and among them were three that stood out with conspicuous prominence. They furnished in themselves ample evidence of the importance and the value of the combination of the four branches of the gas industry that had taken shape and form in the National Gas Council. The report dealt at length with the coal shortage, with financial hardships, and with wages advances. Now, though the Council could not legally promote any legislation, they had fostered the financial hardships question. While the question had had to be raised separately on divers Private Bills, the Council had been able to work up and point the shaft of the movement, so as not only to secure a more efficient representation of the interests, large and small, of the gas industry, but to put the matter into shape by means of suitable witnesses, so that the Parliamentary Committee could not fail to see the issues in front of them. In war time there was no room for compliments; but he must refer to the thoroughly practical, clear, lucid, and convincing manner in which the gas case was put both by that gifted engineer Mr. Charles Carpenter and by the Chairman of their Executive Committee. ["Hear, hear."] Those of them who had seen other people in the witness-box, or had been there themselves, might possibly have some idea, but not a complete one, of what it meant to support a case which, on the face of it, was not popular. He was struck, not only by the manner in which Mr. Milne Watson put the financial case; but by the firmness of his position. He was as firm as a rock; and his replies were clear and convincing. There were, of course, many other witnesses who helped them. Undoubtedly, the Committee must have been impressed by the case put before them, as they were still considering their report. As to wages, and the arbitration which had had to be held, he thought it was obvious the assistance of the Council was of very great value in these proceedings. He had no doubt that undertakings which could themselves drive better bargains were warranted in saying they preferred to make their own terms. The Council had been told that they were not constituted for it; but, constituted or not, they were there, and had to receive the shock. The best thing they could do, therefore, was to call all the interested parties together and confer. If by their action they succeeded in avoiding a position that must have given rise to a number of sporadic and local "down toolings" (which were among the most troublesome and difficult positions in which an undertaking could possibly find itself), they had been of great service. But he ventured to say they did more than this. There, again, he thought, the case that was made out by their friend Mr. Milne Watson was as good as in the circumstances could have been put. All these things—coal, financial hardships, and the wages question—were pressing upon them more heavily than ever. Those who thought two years ago that the financial hardships might pass away, had realized that, so far from doing so, they had "come home to roost." He moved the adoption of the report.

Mr. MILNE WATSON, in seconding, said he would like to tell them how very much he appreciated the all too flattering words of their kind Chairman, Mr. Jones. What had been done by him (the speaker) had been done as a labour of love; and it had been, as it always was, a great pleasure to serve the national cause. He then proceeded to go briefly from paragraph to paragraph of the report—commenting on different points as they arose. As to coal prices, they were still in doubt. It had been stated in the newspapers that miners were asking for another 1s. 6d. per ton, and boys 9d. What would become of this application he did not know; but it threatened further trouble. Stocks of coal were very unsatisfactory at the present moment; and no doubt there, again, the future was very dark. The diversion of household coal to gas-works had been of great advantage; and most of the house coal had proved very fairly satisfactory. This bore out the offer they had made over and over again to the Coal Controller, that they would take any quantity of household coal to the gas-works that he liked to send. The composition, quality, and pressure of gas were still receiving consideration at the hands of the Institution of Gas Engineers, who were getting on with a report. The paragraph "Substitution of Electricity for Gas by Military Authorities," showed that the National Gas Council kept a watchful eye upon everything. Coming to labour, they all knew what had happened with regard to labour and priority; and, as to the schedule of protected occupations, it was pleasant to feel that they as an industry had been recognized, and that adequate protection would be afforded them. About the wages arbitration they all knew; and he thought those who had anything to do with it were all agreed that it was a foregone conclusion what the decision was going to be. This being so, there was nothing to be done but to accept it. The questions before the Advisory Wages Committee and the formation of District Committee would come up again presently, in connection with what the relationship of the industry should be to the Whitley report. No steps had as yet been taken with reference to this; but he understood the Government would be approaching them on the matter. The employment of discharged soldiers and sailors was receiving consideration—especially in connection with labour in the meter works. Meter makers were taking it up very strongly with the various Local Exchanges; and the Government had now been asked to receive a joint deputation of the National Gas Council and the meter makers, so that the facts of the case might be brought before them. He hoped they would meet with some success here. It was no doubt known to those present that the sulphuric acid trade had formed themselves into a National Sulphuric Acid Manufacturers' Association. Of course, all makers of sulphuric acid would be eligible. It was for those who were makers of both gas and sulphuric acid to see that the Association was not used to trammel the gas industry. The reference to sulphate of ammonia was, he thought, one of the most satisfactory items of the report—that they were able to get an extra £2 7s. 6d. per ton from the Government. For this they were very thankful. The question of the sale of tar to distillers had been long delayed, because of difficulty in coming to an arrangement. The difficulty was chiefly one of detail. Now, the distillers had re-organized themselves; and he thought that a very much more representative body would be dealing with the matter on their side. The Chairman had referred to the subject of financial hardships; and he need only add that the Select Committee had adjourned until Tuesday to further consider their report which would probably be ready on Wednesday or Thursday of next week. The second reading of the different Bills had been again adjourned until Monday, the 17th inst. They were very glad that the Scottish Gas Council had got to work, and the Council had co-opted Mr. Lawrence Hislop, of Uddingston, and Mr. J. W. Napier, of Alloa, as members of the Executive Committee. This should prove very helpful in discussing matters generally affecting the gas industry. Turning to finances, it would be seen that in October last there was a deficit of £124. They had, however, been able to weather the storm, and had now a little balance in hand, to enable them to continue the good work. This gratifying result had been brought about by the action of the British Commercial Gas Association, in allocating a sum of £600, to be called up from time to time, as well as by that of individual gas companies who had subscribed £43. They were also grateful to the Institution of Gas Engineers, the Gas Companies' Protection Association, and the Society of British Gas Industries for their grants of £100 each. He had given them the story of the half-year's work; and he hoped it would not be thought the Committee had been wasting time. It was a story of some successes and some failures; but if the battles had not been fought, the position of the gas industry would have been a good deal worse. They must not be judged merely by successes. It must be remembered that they were negotiating with Government Departments who were entitled in all cases to the last word.

CONFIRMATION OF THE MINUTES.

The CHAIRMAN said the motion before the meeting was for the adoption of the report: but at this point he would like to rectify an omission from his opening remarks, by moving the confirmation of the minutes of the last meeting. [This was agreed to.] He would also like to acknowledge the inestimable advantages they had derived from their alliance with municipal authorities—Alderman Kay, Alderman Phillips, and others. These gentlemen supported the Council strenuously, and with the utmost fidelity and goodwill.

PRIORITY CERTIFICATES.

Mr. J. FERGUSON BELL (Derby) said that, before the resolution was put, he thought those who had not taken a very active part in the work of the Council would like to express their gratitude to Mr. Harry Jones, to Mr. Milne Watson, and to the other members of the Committee for the very valuable work they had done during the past half year. The report showed the usefulness of the National Gas Council. It must be remembered that at the present time the country was in the midst of a terrible war; and though some of them, perhaps, considered themselves in dire straits, still he ventured to say that they would have been very much worse off if it had not been for the action of the Council. Therefore, as the representative of one of the provincial gas undertakings, he desired to express the gratitude of his Company—and he was sure the feeling was shared by others—for the good work that was being done in London. On the question of finances, he was glad to see that the British Commercial Gas Association had come along with so substantial a sum; and he was sure the subscribers generally to the Association would be pleased to know it. If he might make a suggestion, it would be that steps should be taken to point out that part of their subscriptions was being transferred to the very important work of the National Gas Council. He was surprised to see that their labours were carried on at so small an expenditure. A matter to which he wished to refer was that of priority certificates. Gas-works, as a rule, were only given a P5 certificate. He had to supply a number of Government works with gas; and they could issue orders to him with a P3 certificate. When, however, he came to give his orders, he had only a P5 one. He did think that this was a matter which the Executive Committee might take up strongly with the Government. It was, of course, in the national interest to keep the supply of gas going; and he did think they ought to be able to get P4, or, better still, P3, certificates. Then the question of coal supplies was a very serious one.

COAL SHORTAGE IN THE MIDLANDS.

In the Midlands things were in a terrible state; and it occurred to him to ask whether the Coal Controller should not prohibit the use of bituminous coal for household purposes. With works so badly wanting coal, it was a pity that people should be burning gas coal, whereas, with a little pressure, they would (with advantage to themselves and to the community at large) use coke. He hoped, also, the Committee would inform the Coal Controller that, if the Eight Hours' Act were allowed to be permissive, and some collieries worked a longer time, this would be a great help.

INDUSTRIAL COUNCILS.

Mr. J. H. CANNING (Newport, Mon.) asked whether the Council had yet decided upon the adoption of any policy with regard to the formation of Industrial Councils and the Whitley report. He thought this was a matter which they should approach with very great care. He would also like to emphasize the point which Mr. Bell had just made with reference to priority. He himself had a standing priority certificate P5. They should press very strongly to see whether they could not obtain something more like justice in this connection from the Government Department.

Mr. MILNE WATSON promised that a note should be taken of the point raised; and that the Executive Committee would do their utmost to see if any concession could be secured. As to the question that was mentioned by Mr. Canning regarding the Whitley report, this had been referred to a Sub-Committee appointed to consider the matter; and nothing would be done without full consideration.

The report was then unanimously adopted.

ELECTION OF A TRUSTEE.

Alderman W. KAY (Manchester) proposed the election of Alderman Sir Hallewell Rogers, of Birmingham, as a Trustee in place of the late Sir Joseph Bellamy. This was unanimously agreed to.

HOUSEHOLD FUEL AND LIGHTING ORDER, 1918.

The CHAIRMAN said the next item on the *agenda* was the appointment of a Sub-Committee to deal with questions arising under the Household Fuel and Lighting Order, 1918. There was a Committee already existing who had done very good work in this connection; and he did not think that they could do better than appoint them as the Sub-Committee. They were Mr. F. W. Goodenough (as Chairman), Mr. A. Stokes (of the South Metropolitan Gas Company), Mr. H. E. Bloor (York), and Mr. Samuel Tagg (Preston).

THE TRADE BOARDS BILL.

Mr. MILNE WATSON said they had received a communication from the Employers' Parliamentary Council on the subject of the Trade Boards Bill. He would suggest that this was a matter which should be referred to the Executive Committee.

This was agreed to.

THE MINERS' EIGHT-HOURS ACT.

Alderman PHILLIPS (Salford) said that there was one matter to which he would like to call attention. The whole country—and, not least among the various industries of the country, themselves as gas undertakings—was being very greatly upset and perturbed by the threatened dearth of coal; and they were told that the whole of the industries of the country, and everybody big and little, were during the next winter, and nobody knew for how much longer, to be put to inconvenience and possible loss, and it might be suffering, from the want of coal. They ought to take advantage of this meeting to say something in regard to the question of coal. What were the facts? The facts were that in 1913 the output of coal per man per annum was about 255 tons. In 1916, after some recruiting had taken place, and the number of men had been lessened, the output of coal had nevertheless gone up by one ton per man, to about 256 tons—he was, of course, speaking from memory. In 1917, however, under Government control, the output per man per annum had gone down to about 243 tons only. This in itself would account for a shortage of 13½ million tons. It was very strange, to those who examined these figures, to find that the output in this country had been diminishing for years. He was still speaking from memory; but if they took a date from about 1907, it seemed to him, from a paper he had seen, that the number of men had increased by 8 p.ct. to get 1 p.ct. more coal. So they might take it as a general statement that the output of coal in this country had been, and was still, tending to diminish. It might be their policy was to get more wages by restricting the output of coal. But the world did not live merely that colliers, as a class, might exist and do well. The colliers rather existed because the country needed them and needed their services. There were some 44 millions of people who were practically dependent upon a million of colliers to help them to coal. While this was the case, what was the position in America? It might be said at once that there the seams were probably thicker, easier to get at, out-cropping on the hillside, and so the output was, and should be, larger. As a matter of fact, the figure was 857 tons per man, greatly aided by much machinery, and considerably aided by the natural circumstances in America. But 30 p.ct. of this was not what they had a right to expect from the British collier. Now, there was such a thing as the Miners' Eight-Hours Act; and this was the point he was coming to. He always had his doubts about the necessity for this Act! ["Hear, hear."] In the case of a strong organization of men like the colliers, he never was convinced that it was absolutely necessary to protect them by getting Parliament to say that they should not be called upon to work more than eight hours per day. But in this Act, he believed, there was a clause giving the Government the right, by an Order in Council, should the necessity arise, to suspend the operation of the Act which limited the working of the miners to eight hours. Well, had not the necessity arisen? When the country was to be rationed for coal, was it not time that the Government were turning their attention to this matter, and saying at all events to the miners: "You may till further notice work more than eight hours"? He was told only the other day by a colliery proprietor that if the miners in the North of England worked three hours a week more per man, there would be no dearth of coal; while another gentleman had told him that if the miners would work one hour per day extra, the shortage would be overcome. If they were so near to it as this, was it beyond possibility that, if an appeal was made to the patriotism of the miners, and they were asked by the Government to work this extra hour, they would consent to do it? Why was everybody sitting down and imagining that, because the Eight-Hours Act had been passed, it ought not to be disturbed? He thought this clause was put in for the purpose of suspending the Act should the occasion arise; and to his mind the occasion had arisen. It seemed to him, therefore, that this was the time, that this was the meeting, and that this was the opportunity for passing a resolution saying to the Government that it was considered they ought to think over the propriety of suspending the Act, and urging the miners of this country to work a little extra time in order to save the people from a dearth of coal. He thought that such a resolution would commend itself to the meeting, and that it was not asking too much that they should pass it. [Applause.]

Bailie DRUMMOND (Glasgow) said he had been very interested in the figures which Alderman Phillips had given—particularly the coal production per man. He would, however, like to say that, as it happened, he himself had had a chat the other day with a collier who had had 24 years' experience in the same pit in Scotland; and his information, on which he thought he could rely, was very interesting. It would almost appear, from Alderman Phillips's figures as if he was wanting to make out that it was a "ca'canny" policy that was the cause of the reduction of the output per man. This might be to a certain extent the explanation; but he had had an explanation from the collier to whom he had referred which put a somewhat different complexion on the matter. This man was in no sense a Pacifist, his own sons had gone to the war; and he said within the last eighteen months the Government had taken from the ranks of the colliers a great number of young men. In many parts of Scotland—which, of course, he was specially able to speak about—there were thin seams of coal which could practically only be handled by young men. Out of each of the two pits with which he was associated, his informant said they had taken something like 52 young men. He did not give the exact number of men working there, but said that the taking away of these young miners had reduced the output 20 p.ct. While this collier did not urge that the Government should stop taking young men, he indicated that this was the effect it was having on the output. Where the seams were narrow, young men were needed to bring the coal to the top. He would like to point to another way out of the difficulty. They tried in the early stages of the war to get the Eight-Hours Act abrogated; and they were up against a very great difficulty. They would have a fight if they tried to do away with the eight-hour day now. His information (received from the same source as before) was that the men were only working eleven days a fort-

night, and they would agree to work an extra day per fortnight rather than have an extension of the eight-hour day. He did not think they should jump at once at the proposal put forward, if they could find an easier way out of the difficulty and arrive at the same result. They should take the line of least resistance; and instead of agreeing to such a resolution as was suggested, they should ask the Executive to consider the matter.

Mr. BELL expressed the hope that the Committee would press this matter, and that the Executive would take action at once. Coming from a mining district, he was informed that the men would prefer an extra hour rather than a greater number of days. A letter from the Coal Controller's Office that morning told him that he could not be given extra supplies, and that the writer was afraid the position would be very much worse than it was. If it did get worse, some of them would have to close-down; and the suggestion made by Alderman Phillips, it seemed to him, was very reasonable. They were only appealing to the patriotism of the miners to help the country in its time of need; and he had sufficient faith in the working man, and in the colliers, to say that, if the necessity was put before them, they would increase the output of coal.

Mr. F. W. GOODENOUGH pointed out that the suspension of the Eight-Hours Act would only make it optional. If the men preferred an extra day in the fortnight, this would be quite open to them. This should be borne in mind in putting the matter before the President of the Board of Trade.

Mr. CANNING asked whether the Government would not be inclined to say that the means of transport were not forthcoming, even if the coal was available? They should safeguard themselves upon this point. A point which strengthened Alderman Phillips's figures was that during the last few years, out of the 250 odd tons per man, something like 20 to 30 tons had been sheer rubbish, as compared with coals which they used to get in pre-war times. This made the dearth much more felt.

The CHAIRMAN remarked that no doubt it was a many-sided question; and they must trust the Committee to approach the matter with tact. He took it that Alderman Phillips was merely desirous of drawing their attention to the subject as being one which should be considered.

Alderman PHILLIPS said he did not wish to move a resolution. The case would be met if the matter were referred for consideration to the Executive Committee, with power to take action. The explanation Bailie Drummond had given, that recruiting was the cause of the reduction, was not the real one; though no doubt it carried some weight. The output of coal per man had been falling for years before the war; and his explanation would not apply to this. If they asked the Government to suspend the Eight-Hours Act, they would give the miner liberty to work longer if he chose, and if it could be arranged; but they would not compel him. They would give him freedom from a restriction which at present existed, and so open the door to those who were willing to work. If they preferred an extra day a fortnight, very good.

It was agreed to refer the matter to the Committee.

A VOTE OF THANKS.

The CHAIRMAN said he would not like the meeting to separate without an acknowledgment of the services of the staff. He could testify to the fact that, after Mr. Milne Watson himself, his staff were the hardest-working people one could possibly have. He proposed a hearty vote of thanks to them.

The motion was passed, and acknowledged by the SECRETARY, Mr. W. J. Smith.

FUEL AND LIGHTING RATIONING ORDER.

By "CRICKET."

> Later on it may be necessary to proceed to the rationing of coal for industrial purposes of all kinds *not directly associated with the conduct and support of the war.*

THESE words were (as reported in the daily papers) uttered by the Coal Controller last Friday in the hall of the Institute of Journalists, in explaining to trade journalists the purposes and working of the new Household Fuel and Lighting Order (1918).

"Later on," mark you! when our industry thought that, at least months ago, the coal supplies to unimportant industries had been properly dealt with. It fully explains the empty coal stores at gas-works. It shows at once that the Coal Mines Department has all along failed to grasp its essential duties from a national point of view. Why should industries "not directly associated with the conduct and support of the war" have unrationed supplies of fuel when gas-works are starving for coal, and are likely to fail next winter to provide gas for the public; and, of vastly more importance still, the supplies of war materials from gas-works for the Admiralty, the Army Council, and the Ministry of Munitions will be inadequate?

It is high time our chiefs called us together to thresh out this matter. The sooner the better. The long list of war material from gas-works given in last week's "JOURNAL" under the title "Gas, Coal, and Electricity Rationing," makes it imperative in the national interests for an industry such as ours "directly associated with the conduct and support of the war" to make a direct appeal to the Admiralty, the Army Council, and the Ministry of Munitions to co-operate with us in their own interests to see that the war material from gas-works is adequate to carry the war to a successful conclusion. I verily believe the Board of Trade Coal Mines Department think we have our own "axe to grind." The only axe the gas industry has to grind is that which is to cleave the head of the enemy.

We cannot afford to wait any longer. Our patience is exhausted. A false sense of modesty has hitherto hid our light under a bushel. Such a false sense of modesty is valuable to the enemy. The interests of the Admiralty, the Army Council, and the Ministry of Munitions are directly connected with the conduct of the war. So are ours.

Why should the following industries not directly associated with the conduct and support of the war (unless they are wholly or partly engaged on work of national importance) have any coal at all? The list is by no means complete. It may be said the Army authorities are taking their employees of military age; but this does not prevent them acquiring men not liable to military service (who should be engaged on work of national importance) to carry on the trade, and use coal to the detriment of the war and the advantage of the enemy: Silver plate ware, jewellery, fancy goods, antiques, furniture, florists, artists' materials, glass and china ware, engravers, fancy bag makers, musical instruments, billiard tables and fittings, fancy clothing, hosiery, drapery, haberdashery, millinery, brilliantine oil manufacturers, builders and decorators, furs, carpets, fancy printing, confectionery, diamond cutters, feathers, fancy ironmongery, French polishers, perfumers, picture frames, art fabrics, and toys.

The new Fuel and Lighting Order does not give sufficient equivalent of gas for a ton of coal, leaving the matter as it does entirely at the option of the consumer to say in what proportion he will take his coal as raw coal or indirectly as gas or electricity, and, threatening punishment for offenders, must lead the consumer to preferably take his ration in raw coal. Raw coal, as I have before remarked, can be seen in the cellar and regulated, gas and electricity meters and their reading present difficulties to consumers; and they are sure to take the safest and easiest means to avoid trouble. The raw coal rations are more than adequate for cooking and heating, and consumers, in many instances, will confine themselves to the lighting ration.

It is high time the gas industry got out of the rut of "public utility," and consequently out of the hands of the Coal Mines Department, and into the hands of the Admiralty, Army Council, and Ministry of Munitions, who, by a recent regulation under the Defence of the Realm Act, have the power in their hands to take us over on account of the valuable and extensive manufactures of war material, which, after all, is now the principal function of the gas industry which is wholly out to defeat the enemy, and has very ample means, if properly guarded, to do a great deal more in that direction than any other industry, though run very close by the coke-oven industry.

Let us meet soon.

A "V.C." for a Gas Engineer's Son.

Among the thrilling deeds recounted last week, when five Victoria Crosses were awarded, were those performed by the son of Mr. Andrew Dougall, late Engineer of the Tunbridge Wells Gas-Works. The "Gazette" announcement is as follows:

Lt. (A.-Captain) Eric Stuart Dougall, M.C., late R.F.A. (S.R.).

Captain Dougall maintained his guns in action from early morning throughout a heavy concentration of gas and high-explosive shell. Finding that he could not clear the crest, owing to the withdrawal of our line, he ran his guns on to the top of the ridge to fire over open sights. By this time our infantry had been pressed back in line with the guns. Captain Dougall at once assumed command of the situation, rallied and organized the infantry, supplied them with Lewis guns, and armed as many gunners as he could spare with rifles. With these he formed a line in front of his battery, which during this period was harassing the advancing enemy with a rapid rate of fire. Although exposed to both rifle and machine-gun fire, this officer fearlessly walked about as though on parade—calmly giving orders and encouraging everybody. He inspired the infantry with his assurance that "So long as you stick to your trenches I will keep my guns here." This line was maintained throughout the day, thereby delaying the enemy's advance for over twelve hours. In the evening, having expended all ammunition, the battery received orders to withdraw. This was done by man-handling the guns over a distance of about 800 yards of shell-cratered country—an almost impossible feat considering the ground and the intense machine-gun fire. Owing to Captain Dougall's personality and skilful leadership throughout this trying day, there is no doubt that a serious breach in our line was averted. This gallant officer was killed four days later while directing the fire of his battery.

When the Tunbridge Wells Town Council had concluded their business last Wednesday, the Mayor said he wished to refer to the great honour done to the town by Captain Dougall, the son of one of their most respected townsmen. They were proud that such a man should have been a citizen of the borough, and deeply regretted that he had not survived to wear the decoration which had been bestowed upon him. It was agreed by the Council that these feelings regarding his son should be expressed in a letter to be written to Mr. Andrew Dougall.

THE FRENCH PROFESSIONAL GAS SYNDICATE.

M. René Masse's Review of 1917.

AT the annual general meeting recently held in Paris the proceedings of the French Professional Gas Syndicate, to which we referred a week or two ago, were unanimously adopted and other formal business was transacted. The chief event of the meeting, however, was the address of the President, M. René Masse, on the work of the Syndicate during 1917, a discourse which supplies a review of the recent conditions of the French gas industry of such authority that a condensed translation of it may be allowed to pass into our pages.

M. Masse contrasted the present position of the Syndicate with that in the year of its establishment, twenty-five years ago, when its membership of 92 represented works supplying only 4 millions of population. At the present time the accession of 93 members during 1917 brought up the membership of the Syndicate to 358, representing a population of 17 millions.

The fourth year of the war had provided still greater occasions for the exercise of the duties with which the Syndicate charges itself in studying the legal questions which arise and in conducting litigation. A Standing Committee—presided over by M. Ed. Kæuffer, and advised by the well-known counsel, M. de la Taste—has devoted its monthly meetings to the multifarious questions of law which have called for decision, and by its publications has made itself a mentor of the members in such matters. The incidence of taxation of various forms in its relation to the gas industry has been one of its chief studies.

The question of increases in the charges for gas (still one of prime importance in France) occupied a large part of M. Masse's address. The ruling of the Conseil d'Etat in the notable Bordeaux case has been a highly beneficial influence in cases where the present inequity of pre-war contracts has called for revision of prices. More than 650 towns have been affected by this question; and in a great many cases the decision of the Conseil d'Etat sufficed to prevail in the hearing of a dispute in a local court. In this connection it is worthy of mention that in two other instances—one dealing with transport liabilities and the other with increase of freight charges—the Conseil d'Etat has re-affirmed its decision as to the illegality of contracts in the drafting of which present conditions were in no way preconceived. It has done so also in terms specifically those employed in the Bordeaux judgment, in a more recent case at Poissy—thus showing that its declaration was one of broad principle, and not merely made in reference to particular circumstances.

Reviewing the vital question of coal supplies during 1917, in its two aspects of tonnage and price, M. Masse recalled the attempt made in 1916 and in the early part of 1917 to distribute available supplies of coal among gas-works according to a system of declaration of stocks and quarterly applications by the gas undertakings individually to the bureau for English coals and that for French coals. The result proving unsatisfactory, the distribution of the whole coal supply was taken over by the Government in collaboration with authorized representatives of each class of consumers. In the execution of this plan on scientific lines, too warm a tribute could not be paid to the responsible Minister, M. Loucheur, nor to M. Delaporte, the head of the Coals Committee of the Syndicate. At the outset, all licences for the importation of English coal and for delivery of that from French beds were vested in the Union E.N.N.O.; but from the end of July, 1917, under the direction of M. Loucheur, the Coal Committee of the Syndicate made itself responsible for the distribution of all coal—thus forming the sole link between the gas-works, the Ministry of Munitions, and the National Coal Committee. As a result of this measure, coal for carbonization was obtained during 1917 in amount very close to that in 1916, although the difficulties of delivery, &c., continued to grow. It is true that some works were compelled to close (73 up to the end of December, 1917), but no important centre has been deprived of gas. In justice to French gas men, it should be said that every effort has been made to maintain the supply of gas—wood, lignite, peat, and vegetable refuse having been carbonized in many districts in default of coal. On the whole, it has been abundantly proved that a good system of distribution has yielded the maximum obtainable from an insufficient supply.

In the no less important matters of price, the solution of the problem is likewise due to M. Loucheur, by whom the machinery for the necessary organization was found ready to hand in the Syndicate's bureaux. As a result, orders were promulgated with the object of bringing the charges for English coal at the port of disembarkation to the level of French coals at the pithead; due allowance being made for differences of quality. The principle of the system thus adopted has been payment to a "compensation office" by all those who obtain more than one-third of their total tonnage in French coals; also by all who sell coke. The amount thus realized is distributed among the consumers of English coals, in accordance with formulæ designed to benefit the small works. This measure, with others, served to establish during the last quarter of 1917 a uniform and relatively low cost (91 frs. per tonne) for the English coals. It is hoped that its full effect will be more widely felt during the present year, and that this system of "per-equation," if it does not avail to wholly disperse the crisis which has persisted for the past four years, will at any rate arrest its development and steady the state of the market.

Turning to bye-products, M. Masse dealt with the incommensurate prices which had been obtained for tar when the high cost of coal was considered. From 35 frs. per tonne on works wagons, the price rose to 56 frs. in 1916 and to 63 frs. in 1917—the latter only double the pre-war price, when coal was costing three to four times as much. It was, therefore, satisfactory that, as a result of the Syndicate's representations, a substantial increase (to 112 frs. 50 c.) had been obtained since Jan. 1 last.

For sulphate, of which the Ministry of Agriculture was the sole buyer, the price had been fixed at 125 frs. per 100 kilos on wagons, with a further 5 frs. for sulphate of extra-dry quality; retort carbon, exclusively requisitioned by the Government, had realized 320 frs. per tonne; while spent oxide was sold at a price based on its content of blue and its excess of nitrogen.

ELECTRICITY SUPPLY MEMORANDA.

IN our editorial columns last week, reference was made to the report and recommendations of the Board of Trade Committee on Electric Power Supply; and it is unnecessary to again go over the part of the ground then traversed. But there are a few other points in the report that are of special concern to the gas industry; and to them it is desired to make allusion. The gas industry cannot oppose, but must welcome, progress in all directions. If this progress is against its interests, it is for the gas industry not only to attempt to anticipate it, but, if this be impossible, to work hard to do all that can be done to counter the effects by strengthening its own technical and commercial position. The one aim and object of the Board of Trade Committee, and of all the Committees who have considered the question of the reorganization of the electricity supply industry, has been economical production; and while we do not say that this is to be best achieved by the proposals that have been made, there is not the slightest question the policy of limited concentration (we do not say huge super-stations, requiring enormous capital outlay for distribution from them) is one that must result in, for electricity supply, a general gain in economy, which will be a commercial advantage. Every Committee who have considered this matter have reported in favour of something of the kind. The report divulges the same views on the part of the Board of Trade Committee; and the proposed setting-up of Electricity Commissions, who are to divide the land into district supply areas over which District Boards are to be appointed, is the beginning of a totally different order of things, which will entirely alter the basis of competition with gas, seeing that even the small towns will get their electricity on unprecedented terms—if the schemes work in result according to plan. At the same time, there is precious little in the report that is actually new. But it must be accepted that, if legislative action is going to be taken by the Board of Trade, this is the report on which they will work. The fact that there is nothing actually new in the report is confirmed by a letter sent by the Electrical Trades Committee to the President of the Board of Trade as long ago as January, 1917. In the letter, it was said there is no authority at the present time, nor is there any effective legislation which empowers any authority to ensure that the best system shall be adopted in the national interest in any district. And a few lines further on: "The Committee feel it is essential that the direction of all matters concerning the future development of this industry should be in the hands of a new and independent Board of Commissioners, free from political control, and untrammelled by past traditions." This is precisely the main idea that is in the Board of Trade Committee's report.

Board of Trade Committee's Report and the Gas Industry.

If the proposal is adopted that one central paid authority—the Electricity Commissioners—shall be appointed to carry out the legislative work of the electricity industry, and to have general control over it, this will be an advantage that the gas industry does not possess; and this difference will be accentuated if the Commissioners are for most part a technically qualified body. For confirmation, one has only to remember what has happened to the gas industry in Parliament in connection with the questions of standards, financial restrictions of various kinds, the fights with the chemical manufacturers, and in other ways. A technically qualified tribunal would consider matters from the point of view of the best economic interests of the industry, and its ability to render the best service possible. To get such a body now would be worth all the legislative drawbacks the gas industry has suffered in the past; and so thinks the electricity industry in regard to itself. The gas industry will have to reckon with this—though, if such a body is established, it will legislate not with an eye to the defence of any other industry, but to the entire advantage of its own immediate charge, the electricity industry. Then there is the question of financial assistance to the District Boards by the Government, if capital is not subscribed locally. As was pointed out in our editorial article last week, any assistance in this direction will naturally tend to give an undue tightening to the bonds between the Government and the electricity industry to the disadvantage of any other industry competing for business in light, heat, and power. The

Advantages Over the Gas Industry.

report suggests for the electricity industry increased facilities for using overhead lines and for obtaining wayleaves; and special consideration in reference to rating is urged. The Committee remark:

> The local rating system as applied to electric transmission mains must greatly, and, we think, unjustifiably, interfere with the supply of cheap power, and enhance its cost. As the use of electricity has come in since the Acts on Valuation and Rating were framed, it seems necessary that they should be revised. Their application to electricity undertakings and appliances should be settled on economically sound principles, and be clearly defined. The matter is one which calls for the immediate attention of the Government.

In short, the Committee, being so deeply concerned in the electricity supply industry, and apparently in nothing else, want something in the nature of "favoured nation clauses." The gas industry would not itself at all mind having special consideration in regard to rating on the ground of its national service, if it could see the justice of any one industry being given special advantage in this respect over any other. Every industry in the country is part of a great complex system; and, as near as circumstances permit, rating should therefore be on a common basis, so that all should share as equitably as possible in the common burdens.

Some of the Advantages of Economy.

The report is attractively framed in other respects. For instance, the Committee make great use of the magnificent service which would be rendered nationally by operating in the way they suggest, so as to secure electrical economy, of the realization of which there is no more proof than that which may be generally surmised would be gained by concentration, though it is easy enough to see that the economy would be largely affected by the question of the capital expenditure upon concerns which will have to be abandoned and by the new distribution costs which must arise from greater distribution distances. It would, it is gathered, work wonders for industry generally by supplying them with economical power; and the presence of economical power would enable new industries to be started. Why is not all the same consideration asked for in respect of the gas industry on the ground of national service—a national service (as wartime has proved) of infinite character. All this excellent result is presented in the abstract for electricity; while, in the case of gas, there has been a large materialization, which could be greater still with adequate legislative consideration and encouragement. In another way, too, there is suggestion which may affect the gas industry, despite its intention to put itself in a stronger position in supplying cheaper fuel and power gas. It is mentioned that there are about 600 bodies generating electricity for public purposes, apart from the very large number of manufacturers, collieries, and others generating their own power. A considerable number of private generating plants are run by gas power; but it is urged in the report that, from the larger electricity generating undertakings, these manufacturers and others owning private plants will be able to take their current at such an inviting cost that the private plants will vanish. It will be for the gas industry to combat this, not by words but by the character and price of their own commodity. Moreover, it would be quite easy for the gas industry to take this report, and to proceed upon similar lines, by the larger undertakings absorbing the smaller and more uneconomical ones, and supplying (with economy) to the users a good combustible gas, of a sufficient calorific power, by high-pressure means. Of course, the whole of the electrical reformation will take time—if the proposals are adopted by Parliament.

Capital.

There are great difficulties confronting the adaptation of the present patchwork electrical system into a uniform system of generation and supply, and one of these difficulties is that of capital, which must affect economy and the charges for current. This is how (approximately) the matter of capital stood in 1916. There were at that time 230 companies and 237 local authorities operating undertakings under statutory authority for the supply of electricity to the public. The capital expenditure had then been by the companies £36,000,000, and by the local authorities £55,000,000—a total of £91,000,000. The report points out that a very large percentage of this total has been expended on the distribution systems, which in most cases will not be transferred. Investigations which have been made in numerous cases show that, while the percentages vary greatly, the average expenditure on lands, buildings, and plant for generating purposes is a little under 50 p.ct. of the total. It is proposed that the district boards should pay for generating stations owned by local authorities by way of terminable annuities, so no cash or issue of electricity stock would, in their case, be involved. As to companies, it is suggested that payment for what is required from them should be defrayed out of the proceeds of the sale of electricity stock. The Committee find they cannot estimate closely the sum that would be involved; but where the generating stations only are required, the proportion to capital expended would be about the same as in the case of the local authorities. Of the £36,000,000 already mentioned as the capital expenditure of companies, about £10,000,000 was expended by power companies under Special Acts giving unlimited tenure. In addition to this, a substantial sum has been expended by railway and tramway companies on generating plant. Then there is the cost of the developments on the lines of the suggested plans; and this outlay will be greatly augmented by the high prices of materials and labour, which will continue to prevail for long after the conclusion of peace.

Special Consideration for Electricity.

It is clear that the Committee are so enamoured of their proposals that they are convinced that to postpone the developments until things sink to a more normal state would be a distinct piece of folly. And here we have one of the appeals to the Government for special financial assistance to the electricity industry:

> The provision of adequate electric power is required for the resuscitation of industry. The problem caused by abnormal costs of new work we think must be faced. The benefit of industrial activity in the years immediately following the war will be of immense importance to the nation, and anything that contributes to it will be of general advantage. We therefore recommend that the Government should go a long way in giving financial assistance; so that installations which are shown to be urgently required, and which are undertaken during a time when the cost of manufacture and erection is admittedly abnormal, should not be unduly burdened by charges for interest and amortization.

This is all very well; but we should dearly like to know why the gas industry, which has been answering the Government's many calls during the war, and has been receiving more kicks than halfpence, should not in its plans of reconstruction be assisted by the Government; for goodness only knows many industries after the war will be looking to the gas industry to supply their needs, and to enable them to roll back the competitive forces which Germany will be hurling against them. It is a puzzle why electricity should be singled-out for financial assistance and peculiar privileges in the ways proposed, just as though there are no other industries equally deserving and equally as important.

Public Utility Prices and War.

A comprehensive analysis of the present disturbed economic conditions resulting from the war and its far-reaching effect on the future operation of public utilities, was informally presented by Mr. William J. Hagenah, of Chicago, at the last meeting of the Wisconsin Gas Association. War, is, he said, the world's greatest disturber, and its greatest destroyer; and the early effect of a great war has always been to increase prices. For over fifteen years before the opening of the great European war, there had been witnessed in America a gradually increasing price level; a persistent movement to a higher level of wages and commodities being co-incident with great industrial and commercial development. With the rapid growth of urban populations, the effect on public utility services was very marked. Capital was secured at ever-increasing rates; and operating expenses rose all round. At the same time, the rates for utility service remained stationary, or were reduced by public action. So long, however, as the utility had not yet reached the reasonable limit of its technical development, and while the territory which it served was still far from saturation, these increasing costs were largely offset by improvements in plant and methods. In fact, there are many instances where, in spite of the conditions prevailing, specially favourable local circumstances enabled net earnings to show annual increases. But when relatively high efficiency had been realized, and the increases in the price level appeared to be gaining in momentum, the trend of net earnings in most cases turned definitely downward. With a reasonable limit of expansion reached, too, the crisis in the history of the utility industry approached. Between the pressure of increasing costs and the declining purchasing power of the dollar of income, net earnings were threatened with extinction. This was the state of affairs at the outbreak of war, when the level of commodity prices—already at the highest point reached in a generation—turned abruptly and violently upward, which tendency it has maintained until the present time. If conditions for the future may be judged generally by the results which have developed from somewhat similar conditions in the past, the decline in prices will be comparatively slow. In the case of the American Civil War, while prices reached their maximum in approximately three years, they did not decline to the level of pre-war conditions until about fourteen years later. The experience in connection with the Napoleonic Wars was similar in character. We may therefore, Mr. Hagenah thinks, look forward to a considerable period of high prices. "I merely want to ask you," he said to his audience, "to reflect on what it will mean to your business to be required to make extensions and to finance your needs on this level of prices while operating under a rate schedule determined five years ago, if we should not return for fifteen or twenty years to the price level on which such rate schedule was based."

Austro-Hungarian Gas Association.—The annual general meeting of the Association of Gas and Water Engineers of Austria and Hungary was held at Vienna on May 31 and June 1. The ordinary business was supplemented by the reading of technical papers, and a discussion on the "Effect of the War on the Position of Gas and Water Works."

WONDERFUL EVOLUTION OF COAL AND ITS PRODUCTS.

The Fuel Research Commission at Work—Fuel Oil and Gas to Supersede Coal—New Sources of High Explosives, Dyewares, and Fertilizers—Drilling for Petroleum.

By WILLIAM LEIGHTON, of Leeds.

OF all the scientific, commercial, and industrial revolutions to which the war has given a powerful fillip rich in all manner of potentialities and possibilities, few can exceed in magnitude and importance the developments of the comparatively newly discovered uses to which coal may be put. Before the war, five-sixths of the immense quantities of coal won in these islands went, in its native raw state, straight from the pitmouth to our homes, our factories, our navy and merchant shipping, or wherever power, light, and warmth were required. Some ten years ago only a few advanced men of science suspected the presence in a lump of coal of chemical forces and other properties which, developed and utilized, might be worth quite as much as the coal itself, and that when these had been wrung from the block the coke that remained would be a commodity almost as marketable and valuable as the original article. Optimistic scientists—backed a little by the State and more by spirited leaders of the mining industry—pegged away, in and out of season, making one discovery after another, till the war arrived and proved to be the most powerful driving force that could be imagined.

The last three years have witnessed an awakening which should figure largely in the history of the war. War chemists have been at their wits' ends for explosives more deadly than anything before discovered; native coal was too gross a source of driving power for the Allied navies; dyers were at a loss how to produce the remarkable range of colours which Germany had extracted from the raw materials we had for years sent to them galore; and farmers were badly short of sulphates and nitrates to energize the soil. The war has solved, or is solving, all these problems. Producers of both coal and gas are now wonderfully alive to the fact that the nation is expecting from them something very much more important than raw coal—qualities, indeed (solid, liquid, or gaseous), that may be classed as the soul of the coal. No modern colliery is now considered up-to-date that has not spent many thousands of pounds upon the latest apparatus for carbonizing and extracting from its coal as many of the valuable essences as can be drawn from it on the spot, before it is sent forth in the shape of coke, gas for generating power and for domestic use, as well as chemical materials for explosives, tar for dyers, and ammonium sulphate for farmers. Geologists, too, are busily mapping-out the various seams of coal all over the country—keeping an eye the while on the possibility of finding petroleum or other precious oil; and chemists are diligently shedding fresh light on the scientific treatment of all bye-products of coal gas making.

A GOVERNMENT RESEARCH BOARD AND ITS PLANS.

On the principle of better late than never, the Government have just stepped in with a scientific and practical scheme by establishing headquarters for research; by taking stock of existing seams of coal, and encouraging the opening-out of new beds; by getting to know all that can be known as to whether petroleum or any other oil is specially worth drilling for; and by stimulating in every possible way private and public enterprise in a great national forward movement that should render incalculable service. A question the importance of which cannot be overestimated is, Are we not within measurable distance of a stage when coal, as such, may be relieved of nearly every duty that it now performs except that of yielding the chemical, explosive, dyeing, manurial, and other properties which may more rapidly advance commerce and civilization? Experts are agreed that if this can be accomplished by the slow carbonization of coal, it will probably be worth while. The Fuel Research Board have an idea that the 40,000,000 tons of raw coal which we burn for domestic purposes yearly could be replaced by either solid or gaseous fuel, and that fuel oil might supplant the creosote which our navy now uses. They are also inquiring whether town gas cannot be more economically produced by carbonization, and whether electric power could be obtained more cheaply if steam coal were carbonized and gasified? If practical shape can be given to all or many of these suggestions, the enormous production of coal that must result will, of course, require serious thought and action. Carbonizing 20,000,000 tons of coal to get 1,000,000 tons of fuel oil for the navy would leave 15,000,000 tons of coke, which the Research Committee might find it hard to dispose of, unless new and untried uses for it were opened-up. Surveying all these startling possibilities, the Durham collier will be sorry to learn that the "cobblings" he unearths are not the "black diamonds" that he loves to call them, but only the shells which are about to be tapped for the diamonds.

From every ton of gas coal carbonized there remains coke variously estimated at from 13 to 15 cwt., of which 2 or 3 cwt. heat the retorts on the spot, and the remainder is sold and devoted to heating boiler fires, smithies, closed stoves, to the cement industry, to the production of water gas, and various manufacturing and industrial purposes. Prior to the war, huge quantities of English coke were exported to Germany and Norway from the East Coast. The volume of this coke trade with these countries was so large that buyers across the water were in the habit of specifying whether they would like coke produced in Leeds, Bradford, or any other particular centre. As a matter of fact, the war has made coal so scarce here at home that coke must needs take its place to a considerably increased extent in any case.

The second important bye-product of gas carbonization is ammonia—recovered from gas by washing it with water. The ammoniacal liquor, with the ammonia, is absorbed in the water; and from this combination the final outcome is ammonium sulphate. Liquid ammonia we all know as a kind of household smelling salts; and the cleanly housewife has great faith in a sort of liquid ammonia which helps her to brighten up everything. Sulphate of ammonia, after requisite preparation, becomes one of the most powerful of the fertilizers by which farmers and small holders hope to double their toll upon the land. The measure of its stimulating powers is that the war has sent its cost up from £12 to £18 a ton. From liquid ammonia is also extracted nitric acid, of which inventors of destructive explosives have recently made great use. It is also a component part of ammonium nitrate, and, with the nitration of the various aromatic hydrocarbons (benzene and toluene), it assists most materially in the output of munitions, before which the German hosts have quailed again and again.

IMPORTANT STARTING-POINTS FOR UTILIZING RICH BYE-PRODUCTS.

These nitrate products, too, have formed a most encouraging starting-point from which scientific and practical experts have made great headway in their effort to bring our dyeing industries up to date. Coal tar is removed by condensation of the hot gas to the amount of 10 to 12 gallons per ton of coal, and is chiefly sold to tar distillers, though at highly progressive gas-works the tar is there distilled. Anterior to the war, the products of gas tar distillation were most extensively exported to Germany, to assist in perfecting dyeware industries, and to Norway and Sweden wherewith to make briquettes. Germany, Holland, Denmark, Norway, and Sweden have never been able to produce all the coal they burn; so they have all been glad to have our coal, tar, and pitch with which to combine slack into lumps. So far, we in England, in war or peace, have been able to extract from under our feet all the clean raw coal we want for every purpose, and to spare. In our homes we burn coal chiefly in open fire ranges. The nations who take our coke, tar, and so on, use them chiefly for slow-combustion stoves.

The various products of coal tar are chiefly recovered by distillation, being usually separated into light oil, creosote, anthracene oil, and pitch. By further distillation of the light oil, benzene and toluene are isolated. Before the war a limited amount of benzene and toluene were produced in England, and sent to Germany, where they were worked-up to pure products. Much of the creosote oil we produced was used in our timber industry, or else exported for various purposes. Pitch helped to make briquettes, insulators for electricians, and to repair macadam and other highways. Some of the heavy anthracene oils were extracted to be used as an element in the production of dyes—the fastest to light and washing, and the most expensive and difficult to produce. The famous Company—"British Dyes"—stimulated by State encouragement, are putting these costly wares on the market as a novelty, and are catering for popular taste by presenting cheaper dyes. Most thoughtful experts in the part of England upon which great expectations for the future of our dyeing industries are centred say that we must spare no effort in the production of both expensive and cheaper dyes if, after the war, we are to make and keep our place.

Carbolic acid, extracted from the light oil fraction of coal tar, was used before the war in the manufacture of disinfectants, and to a limited extent in the making of picric acid. The latter, together with lyddite, forms the basis of high explosive manufacture. Should anyone ask "Why Lyddite?" the answer is that its success was first assured at Lydd, on the Thames Estuary. The same destructive agent is known to, and called by a different name in, half-a-dozen other countries. Naphthalene, which is also recovered from the light oil in creosote production, is another starting point in the advance of dyeware development, and is also taking a place in explosive manufacture. It is most effective on the battlefield, and is yet familiar as a moth-killer in the preservation of furs, and as a cheap and really handy firelighter. Solvent naphtha—another constituent extracted from the light oil of creosote production—is most useful in preserving the rubber tyres of our motors and in making our overalls rainproof.

DESTRUCTIVE COMPOUNDS FOR WAR CHEMISTS.

Before it is distributed to consumers, crude coal gas must be relieved of its small percentage of sulphuretted hydrogen. This extraction is made by means of oxide of iron, and the spent material forms another noteworthy bye-product of the industry. It contains 50 p.ct. of sulphur, and is sold for the manufacture of sulphuric acid, than which few materials for explosives are in greater demand for war purposes. Very large quantities are also

used both in the chemical and textile branches of manufacture. It is predicted that after the war this bye-product of gas making will be very largely used to manufacture dye-wares and many other products for which it can be worked-up. From 7 to 10 lbs. of sulphur are obtained from each ton of coal; and this yields three times its own weight in sulphuric acid. Nearly all the residuals indicated so far, together with many others, are under the control of the Government. Another constituent item extracted from coal gas is hydrocyanic acid. Most of the experts assert that future necessity will compel every gas producer to recover this element, because of its corrosive action on the metal work of plant, mains, and service pipes. But what is more to the purpose, it is rendering most useful service in the part which chemical warfare is now playing at the Western Front. Known as "sodium cyanide," this powerful atom is (or was) extensively used in the recovery of gold from rock. It dissolves the gold. Prussian blue is partly produced from sodium cyanide.

Wartime has added quite a new item to the list of the gas-making residuals that were lost in obscurity before the ill-fated year 1914. Scarcity of benzol and toluol has induced the Government to instal plant at several of the most extensive gas-works in the United Kingdom for the extraction of these components from coal gas. It is found possible to manufacture twice or thrice as much of this substance as is present in coal tar. Thus, the production of these highly important adjuncts in the manufacture of munitions has been enormously increased. Many gas-works are to-day extracting from 1 to 2 gallons of the pure product from every ton of coal they handle.

As one result of war necessities, the calorific value or illuminating power of gas is from 3 to 5 p.ct. less than it was before the war. The present shortage of petrol, which is likely to continue for some time after the war, may induce gas producers to continue these processes of extraction from the coal they treat, in order to add to our stock of motor fuel. They are sure of a ready sale for benzol, for the propulsion of motors, and for lending a hand to the vigorous forward movement of everything connected with the production of dyewares. The present crisis marks an interesting transition, moreover, from the gas consumer's point of view. Till comparatively recently, the householder was content with what is known as a "flat-flame" burner, evidently because he had not tried any other. Now the incandescent burner, which will give ten times the light of the flat-flame burner, has come along, it has quite eclipsed its predecessor, not only for domestic but also for industrial and most other purposes that matter. This little revolution incidentally gave quite a fillip to the demand for gas for domestic, industrial, and metallurgical power, and for all other purposes in such busy engineering centres as Leeds (for instance) where the main features of the new era are well illustrated in every department of the manufacture of gas and its residuals. Above all, it may be taken for granted that the washing of coal gas for benzol and toluol is a practice that is destined to far outlast the war.

(To be continued.)

Masonic—Evening Star Lodge, No. 1719.

The regular meeting of this Lodge should have been held on Wednesday, May 27; but, circumstances necessitating a postponement, it was arranged to have a Tuesday meeting in "Gas Institution Week," so as to afford an opportunity for the Lodge to invite all Masonic brethren of the Institution to attend the formal functions and subsequently dine as guests of the members. The Lodge meeting was held in the Grand Temple at Freemasons Hall, when the W.M.—W.Bro. Fred. J. West, P.M. 3053—ably filled the chair, and carried out the ceremonies assisted by the I.P.M.—W.Bro. A. P. Main. Subsequently, after dinner and a curtailed toast list, hearty recognition was made of the presence of the W.M.'s father, Bro. John West, who was one of two initiates of the Lodge as far back as the year 1878, and whose name stands almost at the head of the list of present subscribing members.

Gas Rationing in Switzerland.—Particulars are given in the current issue of the "Journal des Usines à Gaz" of the schedule according to which gas is rationed in Plainpalais in the Canton of Geneva, following an Order which came into operation in April last. The maximum quantity of gas per month for any household is 40 cb.m. (14,000 c.ft.). Households consisting of a fewer number of persons than eleven are allowed smaller quantities, the scale being as follows: One person, 420 c.ft.; two persons, 600 c.ft.; three persons, 770 c.ft.; four persons, 880 c.ft.; five persons, 990 c.ft.; six persons, 1060 c.ft.; seven persons, 1130 c.ft.; eight persons, 1200 c.ft.; nine persons, 1270 c.ft.; and ten persons, 1340 c.ft. The price of gas to private consumers is 11s. 4d. per 1000 c.ft. Any consumption in excess of the quantities given above is taxed at the rate of 22s. 8d. per 1000 c.ft.; and if the consumption exceeds by as much as 25 p.ct. the quantity permitted under the schedule, the supply is cut off altogether. In the case of commercial and industrial establishments, the limit is fixed at 50 p.ct. of the average consumption during the last quarter of the year 1916. The price of the gas to such consumers is 13s. 6d. per 1000 c.ft.

CHEMICAL TESTS OF GAS MATERIALS.

A French Co-Operative Scheme.

The Société Technique du Gaz has recently completed an arrangement whereby its members obtain the privilege of analytical and other tests of gas materials on payment of fees which, as will be seen below, are fixed in accordance with a very moderate tariff. The arrangement has been made possible by the collaboration of M. Rouland, of the Paris Gas Company and President of the Société, by whom facilities for chemical determinations at the Company's La Villette experimental works have been made available for the general benefit of members. As announced in the "Journal des Usines à Gaz" of May 20, the tests which are to be carried out under this scheme are limited to those of the more ordinary kind, and are as follows, the charge in francs for each being appended in brackets:

Calorific power of coal (20 frs.), moisture in coal (5 frs.), ash in coal (5 frs.), volatile matter in coal (10 frs.), sulphur and iron in coal (15 frs.), nitrogen in coal (8 frs.), nitrogen in ammonia liquor or sulphate of ammonia (10 frs.), water in tar (5 frs.), residue in tar (10 frs.), moisture in spent oxide (5 frs.), free sulphur in spent oxide (15 frs.), nitrogen (10 frs.), and Prussian blue (25 frs.), in spent oxide.

GAS TRACTION COMMITTEE.

An Expert Sub-Committee of the Gas Traction Committee has been appointed for the purpose of giving effect to the recommendations made in Paragraph 18 of the Committee's interim report, and of furnishing periodical statements thereon. The constitution of this Sub-Committee is as follows:

Sir BOVERTON REDWOOD, Bt. (Chairman).
Lieut.-Colonel R. K. BAGNALL-WILD, R.E.
Mr. W. WORBY BEAUMONT, M.Inst.C.E.
Major ASTON M'NEILL COOPER-KEY, C.B.
Prof. C. VERNON BOYS, F.R.S.
Major BERTRAM HOPKINSON, C.M.G., F.R.S.
Mr. E. S. SHRAPNELL-SMITH, C.B.E.
Mr. SIDNEY STRAKER, M.Inst.Mech.E.

Secretary, Mr. CECIL H. LAMB, of H.M. Petroleum Executive.

Paragraph 18 of the report reads—

It is expedient to proceed with experiments and tests in connection with the determination of factors affecting portable gas-generating plants, and the commercial use of gas for traction purposes in containers at high pressures, together with questions relative to liquefaction, absorption, and enrichment, as well as in regard to improvements in the existing arrangements for effecting the admixture of gas and air in the requisite proportions under varying conditions. Authority is accordingly now asked to combine with the second stage of evidence by witnesses independent investigations by an expert Sub-Committee, under our general direction and control.

It is recommended that where necessary any such experiments and tests should be conducted under a special licence, granted by the Board of Trade, in respect of any gas consumption involved.

Commandeering of Metal in Germany.

In the "Vossische Zeitung" of the 22nd ult. it was stated that on information received by a correspondent from an expert, what has not hitherto been mentioned was that "in the gas lighting of all large towns, reflectors of pure copper are used, which without any difficulty whatever, could be replaced by reflectors of sheet iron." The correspondent calculated the quantity of reflectors supplied to German towns by him and other firms in the ten years before the war as 400 tons of pure copper, which he reckoned was "without doubt much more than will be obtained by the commandeering of indispensable household utensils, and pure copper at that, not brass of inferior alloy. The correspondent pointed this out on several occasions to the War Metal Joint Stock Company without receiving any answer; but on the occasion of a personal interview, he was informed that his proposal was not acceptable, because extraordinarily high prices would have to be paid for the acquisition of these reflectors. Subsequently the "Vossische Zeitung" wrote: With reference to the announcement of May 22, the War Raw Materials Department of the Ministry of War, Metals Registration Office, state that the managers of the "War Metals Company, Limited," have no knowledge of the matter mentioned, and the Company have not received any sort of written communication on the subject. It was not possible to ascertain in a department employing nearly 2000 officials whether any one of them, acting in any case without authority, had made such a statement as that referred to. It is added: "Nevertheless it is a fact that the 'Metals Mobilizing Office' in Berlin [the utilization of such metals is not in the province of the War Metals Company], already commenced a considerable time ago the dismantling of the reflectors, and is further occupied in collecting them all. The prices for the copper taken over have been paid at once without demur by the War Metals Company. The quantity mentioned of 400 tons, however, is very much exaggerated."

BRITISH COMMERCIAL GAS ASSOCIATION.

The Executive Committee's Proceedings.

At last week's meeting of the General Committee of the "B.C.G.A." the Executive Committee presented a report in the course of which they stated that the membership of the Association continues to increase. The support of seven new subscribing undertakings had been secured since the last report; and, with a view to getting the support of more of the smaller undertakings, a campaign has been inaugurated among those with an annual output under 50 millions. It was also mention that the income from their former subscribers is being well maintained.

After pointing out that the Gas Traction Committee appointed by the Government (on which the Association was represented) had issued an interim report dealing with the use of gas in flexible containers—"on lines acceptable to the industry"—the Committee state that they are now taking and considering evidence on the use of gas under compression.

It was mentioned that, in support of the work of the Food Production Department, special campaigns are being conducted among the gas-supply undertakings with a view to securing their active co-operation in this national movement; and so far 170 undertakings have promised support. In many instances, practical demonstrations and lectures have been given by the Government experts; while, in others, actual "canning" or "bottling" stations have been established at the gas offices, to which the public are invited to bring produce for preservation. Apart from the all-important food-preservation side of this question, it is remarked, gas undertakings stand to gain ultimately through getting into closer touch, under official auspices, with local authorities and personalities, and, in consequence, furthering the public-utility side of gas service. The Executive have appealed to the industry generally to take up this question, wherever practicable, before the fruit season arrives.

GAS VERSUS ELECTRIC COOKING

IN NATIONAL—AND OTHER—KITCHENS.

At a Meeting of the British Commercial Gas Association on Monday last week, Mr. H. H. CREASEY read a paper on this subject. The chair was occupied by Mr. F. W. GOODENOUGH.

INTRODUCTORY REMARKS BY MR. GOODENOUGH.

The CHAIRMAN, in opening the proceedings, said that the Association did not usually devote its money or its energies to controversial propaganda as between gas and electricity. It was their policy to advocate and expound the case for gas as a fuel and as an illuminant, leaving their opponents to put forward their case and the public to judge for themselves. There were occasions, however, when, being directly attacked, they were driven to counterattack, or when, being indirectly attacked, it was found necessary to enlighten those who were being misled by misrepresentation. When a campaign by their opponents was not only directly and indirectly injuring or threatening to injure the gas industry, but was directly injuring the national interests, it was doubly necessary to do everything possible to defeat such a campaign. This was the case with regard to the special efforts which were being put forward by the electrical industry to capture the national kitchen movement and exploit it for their advantage. Several of the recently-established national kitchens had been equipped, more or less completely, with electrical apparatus; and the Press was naturally being filled with eulogy of the installations. That they were new and electric was sufficient for the Press and for the great majority of their readers. The gas industry had no complaint to make on this score—it was for them to provide the antidote of facts. They had also to remember the fascinating mystery and apparently infinite (though actually in certain respects clearly limited) possibilities of electricity. There were the wonders of wireless telegraphy and of the medical world, and the immense possibilities in almost every branch of industry, which always created a favourable atmosphere for all pro-electricity companies.

This was the reason why the Committee had asked Mr. Creasey to read his paper on the question of gas *versus* electricity in national kitchens, and had decided to devote the greater portion of the June "Bulletin" to the printing of the paper and one or two other matters that were germane to it. Why did he say that the use of electricity instead of gas for cooking was anti-national, both at the present moment and for the future? Because—quite apart from financial considerations, which were considerable and ought to be taken at all times, and now of all times, seriously into account—the use of electricity as a heating or cooking agent was a gross misuse of the nation's coal resources and a flagrant waste of the important bye-products recovered from coal in the process of gas manufacture. It could easily be shown, and quite as easily demonstrated, what waste of coal took place when electricity was used as a heating agent. The thermal value obtainable from 1000 units of electricity on complete conversion to heat was 3,400,000 B.Th.U. Actual tests had shown that in practical cooking as much useful work was obtained from a thermal unit derived from the combustion of gas as from a thermal unit derived from the conversion of electric energy into heat. But to weigh the argument against gas, he would assume that it was necessary to produce 4,000,000 B.Th.U. by burning gas to do the same useful work as could be obtained from the 1000 units of electricity. This would involve the combustion of 8000 c.ft. of gas of 500 B.Th.U. This at the most would require the carbonization of 1500 lbs. of coal, and there would be as residuals 750 lbs. of coke, equal weight for weight with coal as a fuel, as well as other valuable bye-products; leaving a net draught on the country's coal resources of 750 lbs. of coal. The generation of 1000 units of electrical energy entailed a minimum draught on the country's coal resources of 2500 lbs. of coal. This was the best possible practice in electrical generation at the present time. In many cases the coal consumption was twice as high. An average favourable to the electrical industry would be 3750 lbs., or five times the quantity of coal required with gas. This was an estimate favourable rather than unfavourable to electricity, and that was not taking into account the larger losses in distribution in the case of electrical energy than there were in the case of gas distribution. Correcting for this, the net destruction of coal would be 4500 lbs. with their bye-products to do the same amount of cooking work as could be done by the destruction of 750 lbs. of coal in the case of gas. These figures showed that it was coal in the case of gas. These figures showed that it was absolutely unthinkable that electrical energy should be used as a heating or cooking agent, either now or at any future time. It was the particular point, the national point of view, that he wished to emphasize before asking Mr. Creasey to read his paper, in which he had given a good many arguments for salesmen as to why the consumer from his own point of view should not use electricity.

Mr. H. H. CREASEY then read a paper entitled "Gas *v.* Electric Cooking in National Kitchens," the following summary of which appears in the June issue of the "Bulletin of the British Commercial Gas Association"

While the campaign for new business has died-down during the later stages of the world war, the electricians are not sleeping, and it behoves us to be awake. The National Kitchen movement is being exploited by them; and they have exceptional advantages wherever the municipality owns the electricity works.

Profit from Electric National Kitchens is not the object, but publicity. Installation, running, and maintenance costs are minor considerations, and are largely camouflaged.

Electric cooking has very generally failed hitherto; and there is every reason to anticipate its continued failure. But it is better to maintain our ground by exposing the weaknesses and fallacies of the electricians' case than to have to regain lost ground by counterattack. Moreover, it is our duty to the public to protect them from being misled into costly and unsuccessful experiments.

Practically, all the installations of electric cooking that have not been complete failures have been installed and maintained by interested parties. Even in such cases, extensions have taken the form of gas apparatus, not electric. So-called "electric" kitchens are usually bolstered-up on the quiet by gas or coke or both.

When the conditions have been unbiassed, failure has resulted—as (to take leading cases in London) at the National School of Cookery, a County Hall, a Hospital, and an "Electric" Restaurant.

The drawbacks to electricity for cooking are: High cost of installation; excessive cost of fuel—at 1d. per unit four times that of gas at 2s. 6d. per 1000 c.ft.; high and uncertain cost of upkeep; difficulty of management; lack of facilities for hot-plate work; slowness of operation; elaborate system of heat controls and signals required; occasional shocks caused to the cook.

The claims made for electricity as to saving of meat shrinkage are unfounded. The roasting of meat plays, moreover, a small part in cooking.

The claim that gas fumes affect food, while electricity does not, was disproved by the "Lancet" many years ago.

There is no greater cleanliness with electric than with gas cooking.

Where electricity is used for cooking, the water heating is generally done by gas, or the water is drawn from coke or steam heated boilers.

The electrical correspondent of the "Times Engineering Supplement" confirms many of the arguments against electricity as a satisfactory medium for cooking. It should, in his opinion, be limited to certain processes only. "Gas should be used for all boiling and steaming processes." There is not much hope of capturing the domestic kitchen business on these lines.

Electric cooking is not a commercial proposition.

Discussion.

The CHAIRMAN said the author had certainly dealt with the subject thoroughly; and it was very desirable that he should, because the paper

was not intended merely for reading at the meeting, but as an armoury of argument for the representatives of gas throughout the country who might be faced with the problem of fighting electricity for cooking purposes. Therefore, it was desirable that the subject should be dealt with as fully as possible.

Mr. CHARLES WOOD (Bradford) said he had listened to the paper with interest, because many of the figures in it were new to him. He knew that gas had a strong case; but until he read the paper, he had no idea that it had such a strong one. They would all appreciate the paper and make considerable use of it. He moved a hearty vote of thanks to the author.

Mr. A. P. MAIN (Messrs. R. & A. Main), in seconding the vote of thanks, said that they were all much impressed with the ability and care with which the author had dealt with the subject, which was one of enormous importance. There was material in the paper which, if properly used by gas engineers throughout the country, would most effectively counter the work of the electrical people.

Mr. ALEXANDER WILSON (Glasgow) also expressed the view that the paper would be of great use to gas engineers. It would be advisable to, as soon as possible, put it into the hands of their inspectors, who went about the district; so that they could meet the consumers with their armoury filled with the proper weapons.

Mr. H. M. THORNTON said it was very important to remember that the national kitchen movement was about to begin a rather more important phase than hitherto. He knew that certain arrangements had been made by the Treasury to grant sums of money for the purpose of national kitchens; and Alderman Spencer, with whom he had had some association since the national kitchen movement began, was very desirous indeed of giving all sides perfectly fair play. He was speaking of the four methods that were likely to be used for cooking in national kitchens—viz., gas, steam, coal, and electricity. Whether this attitude on the part of Alderman Spencer was one which, from the national point of view, was entirely desirable, was a matter for the Government; but he was taking the view that, so far as he was concerned, the decision of what fuel should be used should be left to the local authority who had to decide whether they should put up a national kitchen or otherwise. It was not at present, and probably never would be, compulsory that they should put up a kitchen. It was desirable, if gas companies wished to get gas established in these kitchens, that they should be alert to find out if such a movement was likely to be undertaken by the local authority; and their Chairman (Mr. Goodenough), knowing the desirability of gas being properly represented—he was now speaking of the supply side—had made arrangements with Alderman Spencer for a representative to be on his Committee, and he believed Alderman Spencer had expressed his willingness to consider the question of advising gas companies whether a local authority was likely to take part in the movement. In this way the local gas undertaking would be made aware of the circumstances at an early stage. If this were done, it showed what a fair-minded man they had in Alderman Spencer as Chairman or Director of National Kitchens; and he hoped that when the gas industry's representative got on the Committee, he would know all that was proceeding. He believed they would find that local authorities and gas companies would have an opportunity of discussing ways and means of national kitchens, and whether gas, steam, or electricity should be used. Mr. Creasey's paper would give local authorities every opportunity of deciding whether one kind of fuel or another was the most desirable for the purpose. It was undoubtedly in the national interests that all these things should be considered; and he believed that when they had their representative on the National Kitchen Committee, they would get every consideration.

Bailie DRUMMOND (Glasgow) said that at the last meeting of the Glasgow Corporation, a Committee was appointed to go into the question of national kitchens; and one of the members of the Corporation, in suggesting that the Committee should be a strong one, made the statement that he believed in a very short time 200,000 people would have to be supplied daily from these kitchens. If this paper could be got into the hands of local authorities as quickly as possible, it would do a very large amount of good. He could not help thinking, as the paper was being read, that it was almost a mistake for gas people to do anything to prevent electrical appliances being installed, because their failure was the finest possible advertisement for gas. At the same time, it was a very unfortunate thing that the great expense of installation and upkeep of electrical kitchens should be foisted on the general public. They had had some little experience in Glasgow—not in a national way, but some large electrical cooking installations had been turned out and gas supplied instead. Some Government officials, at any rate, seemed to be rather sympathetic towards electricity, because in connection with the movement for housing the working man and the commandeering of hotels in the city—whether it was the Government officials at the back of it or their own officials, he was not sure, and he was not going to say—but in some of these large hotels, all the cooking arrangements were fitted for electricity. There had not been a very long time for the experiment, and they did not know how they would do; but the Gas Department felt rather keenly on the matter.

Mr. W. J. JACKSON (Leith) remarked that he had had some experience of communal kitchens. In his town, the demand was almost entirely for soups and stews. This brought home very clearly Mr. Creasey's point that the electrical people were always talking of roasting. The relative cost of boiling and stewing was an important point to be kept in front in dealing with electricity, because experience had shown that much more of this was done than roasting.

The CHAIRMAN said he did not suppose there would be any dissension as to the vote of thanks. With regard to getting the paper into the hands of the local authorities as soon as possible, the best thing would be to arrange to have the paper printed separately as an article on the subject, with perhaps a few excisions of points that were more for the gas man than the general public, and, as a preface, some of the facts he himself had given as to the great waste of coal that was entailed in the use of electricity in cooking: Then they would circulate copies to every manager of a gas undertaking—not merely subscribing undertakings—with a request that they should notify the Association as soon as possible how many copies they wished to have for putting into the hands of councillors, &c. In this way they would get the information circulated throughout the country. It was another case of want of courage and decision of Government departments that the National Kitchen Department should be talking at this time of day of giving a fair chance to each of the four methods of cooking—of leaving the local authority to determine which method they would adopt, and giving electricity as one of them. It was an extraordinary thing that Government departments had not by this time discovered that the use of gas meant the production of important bye-products for which other Government departments were begging, and that they had not the courage to tell the people throughout the country that gas was the right thing to use. They were evidently afraid of it being said that they were supporting one particular trade, although they knew that if gas was used it was the right thing from the national point of view; while if raw coal was used, it was the wrong thing from the national point of view. They were afraid of taking the definite line of saying to the authorities throughout the country: "You are to encourage the use of gas wherever it can be obtained." It was lamentable that, even towards the end of the fourth year of the war, Government departments had not been able to pluck up the courage to do what they themselves knew was the right thing. It only showed how strongly entrenched the electrical interests were in official circles. The idea was that electricity was the thing of the future; but nobody seemed to realize that gas was at any rate the thing of the present.

Mr. CREASEY, in acknowledging the vote, and replying to the discussion, said that he agreed with Bailie Drummond as to the value to the gas industry of more electrical cooking installations being put in, if the true facts of the failures were allowed to leak out. But the failures were bound to be bolstered-up at any and every expense. No stone would be left unturned to see that they were not allowed to become failures, and the world, or at any rate the gas industry, would never know the trouble that had arisen with them. He was afraid that this would be done to such an extent that, after the war, the electrical apparatus would be in the first bloom of youth, and the electrical people would say to the public "Look what we did in the great war."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Calorific Values per Ton and Inert Gas Constituents.

SIR,—A very material error has occurred in the publication of my letter of May 30 in so far as the expression 500 B.Th.U. has been substituted for 550 B.Th.U.

My question should read "whether is it better to obtain per ton of coal (say) 12,500 c.ft. of 550 B.Th.U. gas, or 15,000 c.ft. of 400 B.Th.U. gas," &c., &c.

My typewritten letter is quite clear in this respect.

Howard House, 4, Arundel Street, Strand, June 5, 1918. W. R. HERRING.

[We exceedingly regret the misreading by the printers of the typescript Mr. Herring sent for publication last week.—ED. G. J.]

SIR,—I am very interested in this subject, and in Mr. Herring's remarks concerning it. Mr. Herring's letter in your issue of the 4th inst. is too involved to attempt to deal with many of the issues it raises. With your permission, I will simply deal with one.

Is it better to obtain 12,500 c.ft. of 500 B.Th.U. gas or 15,000 c.ft. of 400 B.Th.U. gas? The question concerns the gas-maker and the gas-user. Volume must be left out of the question. The B.Th.U. are (say) identical in number, but not in the company they keep. Can the gas-maker produce 6,000,000 B.Th.U. in a 400 gas for less money than he can produce the same number in 500? Can the consumer get as much service out of 6,000,000 B.Th.U. in 400 as he can out of the same quantity of B.Th.U. in the 500? My answer to the first question is that the gas-maker can make B.Th.U. in a 400 gas for much less than he can make them in 500, and that the consumer can get a better duty out of the 400 gas in existing appliances (I exclude all high-pressure uses) at low pressure.

If such appliances were in use, and gas were distributed at such a pressure that the efficiency depended on the B.Th.U. value alone, to be fair to the consumer, 400 gas would, of course, only be worth to him four-fifths of the 500 gas.

Mr. Herring is, I think, quite right in many cases. There is a "very material heat loss per ton of coal carbonized in obtaining the greater yield." It depends, however, how the greater yield is obtained.

So far as inerts are concerned in the majority of uses they are of a negligible quantity. One B.Th.U. is as good as another.

I go so far as to state that if 350 B.Th.U. gas net were distributed to-day, and such gas were made rationally, 25 p.ct. of the coal used on gas-works would be saved without reducing the bye-products in the aggregate.

GEORGE HELPS.

Nuneaton, June 8, 1918.

The Coal and Gas Rationing Order.

SIR,—Now that we have a revised (and certainly more logical) Fuel and Lighting Order, it is to be hoped the regulations governing its application will be carefully thought-out before being transmitted to the authorities concerned. If it be true (and no one doubts it), as Sir Guy Calthrop says, that "this is no time to improvise new machinery for administering the Order," it is equally true that gas undertakings have no margin of staff to engage in work of supererogation, or with which to experiment in half-devised schemes of economy.

Gas officials were loyally intent on doing their best to make the first

Order a working success. I believe the majority have issued circulars to their customers, giving the quantities consumed during the last two years, and the quantities allowed under the Order. This imposition is barely completed by the attenuated and lack-leisure staffs before the new Order appears, rendering all their work void and of no effect.

It is now clear that the new Order will exact further efforts from the staffs of our undertakings; and in view of our recent experience, one would venture to urge on those responsible for the negotiations on behalf of the gas industry the need for simple and workable provisions for putting the Order into effect. While the authorities may be assured of the co-operation of the industry, the Order should be framed with a view to entailing a minimum of effort on those who will have to carry it out. Above all, we want to avoid if possible expedient heaped on expedient such as has characterized other forms of Government control.

F. A. GULLAND.

Maidstone, June 8, 1918.

P.S.—One notices the new Order is entitled the "Household Fuel and Lighting Order." How far its provisions are to apply to business premises is not clear from the preliminary statement.—F. A. G.

Scientific Burner Production.

SIR,—I was present, by invitation, at the meetings of the Institution of Gas Engineers, and listened with some surprise to a speech made by Mr. Charles Carpenter, D.Sc., who prefaced his remarks on the report of the Refractory Materials Research Committee by referring to the question of a calorific standard, illuminance, and the production of gas-burners, and stated that gas-burners generally were produced in the factories and sent out to ironmongers and gas companies without being tested.

This discreditable method, from my own knowledge as Chairman of Section VII. of the Society of British Gas Industries, is the exception to the rule of all manufacturers of gas-burners of repute; and as such a statement would create a very wrong impression amongst gas engineers throughout the country, I should like to say that, so far as my own firm is concerned, no burner leaves the works without being thoroughly tested. Every injector is subjected to a test of 12-in. pressure; and the assembled burner is tested for general efficiency.

The subject of scientific burner production is one that has occupied the minds of all British manufacturers for some years; and when one realizes that no Continental competitor can produce any gas lighting medium equal to the British manufactured article to-day, it goes to prove that the manufacturers have not been idle in research, and are giving the gas industry as perfect an article as science can make it possible to produce.

F. J. GOULD,
Chairman of the Bland Light Syndicate, Ltd.

29, *Little Trinity Lane, E.C., June* 6, 1918.

REGISTER OF PATENTS.

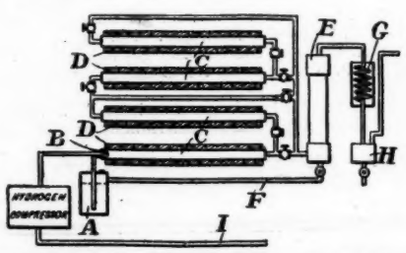
Production of Phenols.—No. 106,274.

BOSTAPH ENGINEERING COMPANY (Assignees of A. S. RAMAGE), of Detroit, Michigan, U.S.A.

No. 4436; March 27, 1917. Convention date, April 20, 1916.

This invention consists broadly in the production of phenol and its homologues by causing hydrogen and high-boiling tar acids to react together in the presence of a hydrogenating catalyst—preferably nickel. It is probable, the patentees remark, that by this treatment the oxymethyl groups, together with a part of the methyl groups, are substituted by hydrogen, thereby producing a mixture containing phenol and cresol.

The catalyst preferably used is nickel, reduced from nickel hydroxide at temperatures below 325° C. and distributed over long fibred asbestos. This is placed in tubes adapted to be heated by a resistance coil. The oils containing the high boiling tar acids are sprayed into the heated tubes containing the catalyst, together with (preferably by means of) an excess of hydrogen gas. The oil-fraction employed for the purpose is preferably that collected between 210° and 300° C. The product is condensed, and if desired purified, and the excess of hydrogen collected for re-use.



Ramage's (Bostaph Engineering Company) Phenol Producer.

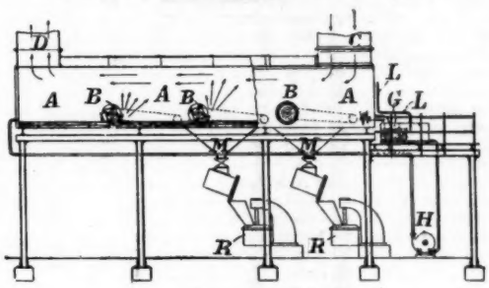
One form of apparatus for carrying out the invention is shown in a diagrammatic vertical section. A is a tank for containing the material to be hydrogenized. From it the material is delivered to an injector B (of the Schütte-Koerting type). Hydrogen is supplied to the injector under a pressure of about 40 lbs., or sufficient to establish a flow of the vapours through the system. The material thus atomized is sprayed into a series of interconnected tubes C containing the catalyst, each tube heated by a resistance coil D. From the tubes a valved pipe leads to a condenser, operating as a reflux, whereby the high-boiling or unconverted material is returned through the pipe F to the tank A for reprocessing. The converted product passes in the form of vapour to the condenser G, the condensate flowing to the receptacle H, from which it may be withdrawn as desired. The uncondensed gases (consisting largely of hydrogen) are carried through some scrubbing or purifying system, and thereafter returned by the pipe I to the hydrogen compressor together with such addition of hydrogen from extraneous sources as may be required.

Recovering Sulphate of Ammonia from Producer Gases.—No. 114,658.

MELLOR, F., of Dennistoun, Glasgow.

No. 5096; April 11, 1917.

This invention has for its object to provide apparatus whereby sulphate of ammonia is obtained from producer gases in one operation, instead of first passing the gas through an acid tower or washer and afterwards treating it in concentrating plant, as heretofore.



Mellor's Sulphate Plant.

The apparatus shown comprises a rectangular box A in which are a number of rotating paddles B. The gases enter at C at a temperature of approximately 95° to 105° C., after they have been treated in a preliminary mechanical washer (not shown), and leave at the other end D. The box communicates by a trapped pipe with a tar-separating tank G. A pump H is connected with the tank and with the opposite end of A, so that a stream of liquor is kept in circulation through the washer and tank. The liquor has a maintained content of approximately 3 p.ct. of sulphuric acid supplied by a pipe L; and the liquor is sprayed by the paddles, so that the gases in passing through the washer are thoroughly scrubbed and the ammonia taken up by the sulphuric acid, while the heat in the gases prevents condensation. In the bottom of the washer are two wells M, each fitted with a discharge valve, controlling communication with receptacles below, fitted with doors and placed over shoots discharging into centrifugal drying machines R.

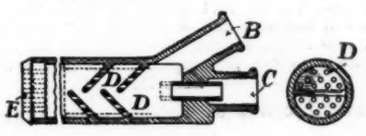
In time the circulating liquor becomes saturated, and crystals of sulphate of ammonia separate out. These fall into the wells M whence they can be discharged in turn into the drying machines. Tar gathering on the surface of the liquor flows with it through the trapped pipe into the tank G, where the tar may be skimmed off. After the gases leave the washer, they pass, as usual, through cooling and heat exchanging towers.

Mixing Air and Gas under Pressure.—No. 114,969.

WALLWIN, J. M., of Salford.

No. 13,125; Sept. 13, 1917.

This is a modification of patent No. 113,032, which described the incoming air and gas being led to a passage (through which it has to pass to the point of combustion) in which is a perforated cone through which the mixture passes "to cause a more perfect co-mingling of the same." Such co-mingling is effected, according to the present invention, by providing forwardly inclined perforated baffle-plates in the passage, arranged in pairs—one baffle-plate of each pair being carried from the opposite side of the passage to the other, with the inner edges of the baffles over-lapping, so that the main stream of gas and air is compelled to take a zig-zag course.



Wallwin's Gas and Air Mixer.

The pipe or conduit shown is provided with gas and air inlets B and C respectively. Within the pipe are pairs of inclined baffle-plates D. The inner edges of the baffles overlap and are perforated, so that in practice the main stream of the gas and air mixture is caused to ascend over, and descend under, the respective lower and upper plates; while smaller streams of the mixture pass through the perforations in a straight line, so as to meet and mix with the main stream. The mixture passes from the inclined plates to the burner E.

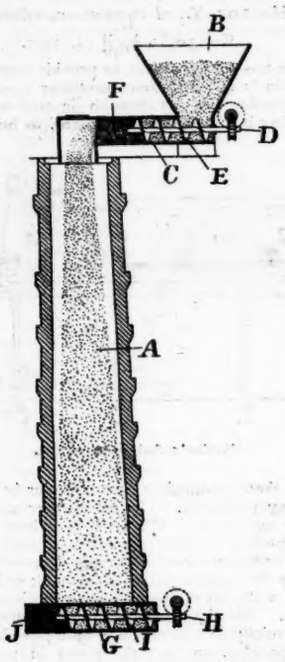
It is preferred that the number and (or) size of holes in the baffles should be such as not to allow too free a passage of the mixture, but to compel the bulk to follow a zig-zag path. Further, the area of the space between the overlapping edges of the baffles should be not less than 25 p.ct. greater than the combined areas of the air and gas inlets.

Carbonizing Coal.—No. 114,971.

YEADON, J. A., and WHITAKER, T., of Leeds.

No. 13,694; Sept. 24, 1917.

This invention consists in a method of continuous carbonization, wherein the coal, as a very finely-ground powder, is mechanically caused to fall "freely, continuously, and directly" through the entire length of an approximately uniformly heated vertical retort, so as to be "continuously, completely, and almost instantaneously" carbonized during the fall, and in which the completely carbonized coke produced is mechanically and continuously discharged from the bottom of the retort.



Yeadon and Whitaker's Continuously-Acting Vertical Retort

The patentees first grind the coal to a very fine powder; and it is then mechanically conveyed to the top of the feed-hopper of each retort. Connected with each retort A is a hopper B combined with a horizontal cylinder C, open at the top (under the hopper) to receive the prepared fine coal. In the cylinder is an internal revolving shaft D, having a screw E (or adjustable knives or blades) by which the fine coal is forced continuously through the cylinder to the mouthpiece of the retort. The screw-shaft does not extend to the discharge end of the cylinder C; so that there is always a certain quantity of fine coal tightly pressed into the discharge end F—thus forming a tight "seal" and preventing any escape of gas or ingress of atmospheric air.

As the fine coal is continuously discharged into the top of the retort, it becomes broken up, and in falling freely and directly through the entire length of the heated retort it becomes "almost instantaneously carbonized," thus releasing the gases continuously at their richest quality, and allowing the coke to fall continuously to the bottom of the retort. The patentees remark that the degree of fineness of the ground coal, the quantity fed into the retort, and the length and dimensions of the retort itself, can thus be so calculated and regulated throughout that none of the fine coal reaches the bottom of the retort without becoming thoroughly carbonized. "No inferior quality of gas can thus be produced—the gas being of one uniform quality throughout, and an even pressure or even vacuum being continuously maintained inside the retort, thus minimizing any carbon deposit there."

The bottom of the retort is fitted with a continuous discharging apparatus for the coke on a similar principle to that feeding in the coal at the top—namely, an open top cylinder G under the retort, fitted with an internal revolving shaft H and screw I—the length of the shaft being so limited that a certain quantity of the fine coke, before being discharged, also forms a tight "seal" in the discharge end of the cylinder G, and prevents any escape of gas or ingress of air.

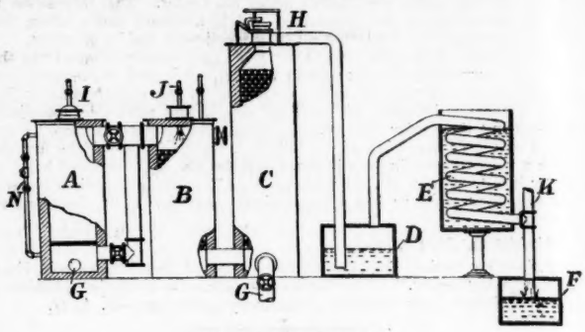
Manufacture of Toluol.—No. 115,066.

THUMAN, F., a communication from O. B. EVANS, of Philadelphia, U.S.A.

No. 5567; April 20, 1917.

According to this invention, naphtha is subjected to a high temperature in the presence of steam or water gas (or a mixture of both) in a chequer-brick chamber, whereby it is converted into a hydrocarbon gas and into a vapour consisting of toluol and other members of the aromatic series. This vapour is later condensed out of the gas as a drip, from which the toluol can be recovered by distillation by one of the well-known methods.

By way of illustration, the patentee says that when fixed in the presence of water gas at a temperature of about 1500° Fahr. there will be produced from the naphtha about 20 c.ft. of gas per gallon, having a candle power of approximately 70. The drip recovered will amount to about 70 p.ct. of the original naphtha used, and will contain about ten times the percentage of the low-boiling compounds (such as benzol and toluol) as that present in the untreated naphtha.



Evans's Toluol Plant.

The illustration shows the apparatus suggested for the practice of the invention—a water-gas set.

A is the generator; B, the carburetter; C, the fixing chamber or superheater; D, a washbox; E, a cooling coil; and F, a drip receptacle. G are air connections for blasting the generator to make producer gas and for burning the producer gas to preheat the chequer-brick lining. The products of combustion pass off at H.

The apparatus is operated in the usual way. But during the runs naphtha is introduced at I or J—that is to say, the water gas is carburetted with naphtha. The associated naphtha and blue water gas traverse the chequer-brick, wash-box D, and the cooler E, and the carburetted water gas is led off by the pipe K. The drip collected in the wash-box and in F contains a high percentage of crude toluol; that condensing in the latter having a higher percentage of toluol than that in the wash-box.

During this carburetting and fixing, it is said that "some of the naphtha is chemically broken-down or molecularly rearranged and converted into toluol, for the quantity of the latter recovered exceeds the quantity present in the naphtha."

Inverted Incandescent Gas-Burners.—No. 115,215.

RAYBOULD, A., and HANDS, G., of Birmingham.

No. 1138; Jan. 19, 1918.

This invention refers to burners supported from the suspending fitting by a readily made swing joint. But usually such joints are liable to be disconnected by a bump from below lifting the burner tube sufficiently for the necked part to fall out of the slotted or gapped member. The inventors propose to provide a device for locking the part connected with the burner tube within the gap or opening connected with the fitting. This locking device takes the form of a rising and falling sleeve or ring mounted upon the part in which the gap or opening is formed. It is thus "returned by gravity to its locking position and cannot be left accidentally in a position in which the gap or opening is unprotected."

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for June 5.]

Nos. 8709—9085.

ALLEN, E.—"Flexible gas-containers." No. 8942.

BUSSELL, R. C.—"Vapour burners." No. 9067.

CAMERON, W.—"Supplying gaseous fuel to internal combustion engines." No. 8904.

COLE, E. G.—See Allen. No. 8942.

COLE, W. J.—See Bussell. No. 9067.

COUCHMAN, A.—"Machines for pleating and sewing incandescent gas mantles, &c." No. 8861.

DAVIES, W. E.—"Preparation of fuel briquettes, and utilization of same in carbonization, combustion, gasification, &c." No. 8969.

HALL, F. W.—"Gas-supply mechanism for motor-cars." No. 8728.

HERSEY, S.—"Apparatus for effecting intimate contact between liquids and gases." No. 9005.

KIRKHAM, HULETT, AND CHANDLER.—See Hersey. No. 9005.

M'GREGOR, D. G.—"Generator for gas-turbines." No. 8897.

MATHERS, G. S. A.—See M'Gregor. No. 8897.

NEVILLE, A. C. E.—"Incandescent gas lighting." No. 9085.

PERRY, W. P.—"Apparatus for distilling carbonaceous material." No. 9010.

SPENCER, A. C.—"Flexible gas-containers." No. 8942.

STRACHE, H.—"Apparatus for determining heating value of gases." No. 8960.

WILTON, N.—"Manufacture of sulphate of ammonia." No. 8812.

WILTON, T. O.—"Continuous dehydration and distillation of tar, &c." No. 8813.

Threatened Gas Supply Stoppage at Gainsborough.—At last week's meeting of the Gainsborough District Council, the statement was made that the town was within measurable distance of a coal and gas famine. Mr. John Baldwin, the Gas Manager, said that although they had made more gas during April and May than at any corresponding period in normal times, there was a greater shortage than ever before, and the gasholders had been nearly emptied. He could not understand where the gas went to. There was only three weeks' stock of coal in hand; and the Coal Controller proposed, therefore, to decrease the supply to the works by 20 p.ct. Unless the most stringent economy were practised, the town would be placed in the greatest dilemma it had ever known.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The British Gas Light Company (Norwich) Bill was reported, with amendments.

HOUSE OF COMMONS.

Progress of Bills.

The Brixham Gas Bill was read a third time, and passed, with amendments.

The Wandsworth, Wimbledon, and Epsom District Gas Bill was read a second time, and committed.

The Aldershot Gas, Water, and District Lighting Bill, the Chepstow Gas Bill, and the Pontypool Gas and Water Bill were reported, with amendments.

The Swansea Gaslight Company have petitioned to be heard against the Local Government Board Provisional Order (No. 6) Bill.

Financial Hardships Bills.

On Thursday, when the Order was read for resuming the adjourned debate on the motion for second reading of the 24 "Financial Hardships" Gas Bills,

The DEPUTY-CHAIRMAN OF COMMITTEES (Sir Donald Maclean) said that the Committee set up to deal with these Bills had not yet reported; and he therefore moved that they stand over until Monday, the 17th inst.

This was agreed to.

Gas Charges.

Colonel BURN asked the President of the Board of Trade if he proposed to sanction the attempt that was being made by gas companies to abrogate the sliding-scale which has been in practice since 1875, and by means of which, during a period of high prices, the increase of cost had been divided between the company and the consumer, seeing that the change would enable the companies to pay an increased pre-war dividend entirely at the expense of the consumer.

Sir A. STANLEY replied that the subject was now under consideration by a Select Committee of the House, and until they had reported he was not in a position to make any statement on the matter.

Dirty Coal and Gas-Works Bye-Products.

Among the questions "not for oral answer" are two standing in the name of General Croft, in the following terms:

To ask the President of the Board of Trade if he will state how the estimated percentage of 5,000,000 tons of dirt at present included in the exported and coastwise coal is proposed to be dealt with by the Government; whether any official action has been taken to exclude the dirt; and whether his attention has been called to the meeting of the Southern District Association of Gas Engineers and Managers held recently, when they came to the conclusion that the coal could be properly cleaned, and 5,000,000 tons of wasted tonnage due to the extra dirt contained in the coals might be saved.

To ask the President of the Board of Trade whether, bearing in mind the fact that the bye-products obtained in the production of coal gas are necessary to the munition industries and as fertilizers, he will take steps to encourage the consumption of gas in the place of raw coal by householders, in order that the gas-works may have first call upon all available coal supplies.

Coal and Coke.

Sir C. SEELY asked the Secretary of State for the Home Department the total output of coal in the United Kingdom in the year 1917 and the export of coal and coke for the same year.

Mr. BRACE, in reply, said the total output of coal in the United Kingdom in the year mentioned was 248,499,240 tons; and 34,995,787 tons of coal and 1,278,646 tons of coke were exported in that period.

German Coal Tar Dye Patents.

Following the application last week for title to use German coal tar dye patents, British Dyes, Ltd., of Huddersfield, applied in the Patents Court on Wednesday for about fifty German patents in the name of the Fabenfabriken vorm Friedrich Bayer & Co., for the manufacture of dyestuffs and intermediate products. Nine of the patents are unseated, or patents of so recent a date that the war has interfered with their registry. These include colouring matters for wool and cotton. British Dyes, Ltd., have now applied for about 200 patents, which they are using for manufacture and research. The Controller of Patents said that all the licences would be granted. The royalties would be 2½ p.ct. on the dyes and 1 p.ct. on the intermediates.

Advances in Leeds Gas Charges.—The advances of gas charges at Leeds, as briefly mentioned in the "JOURNAL" last week (when publication was not thought advisable by the Gas Committee) and adopted last Wednesday by the City Council are as follow: Under 500,000 c.ft. per year, by ordinary meter, from 3s. 1d. to 3s. 4d. per 1000 c.ft.; from 500,000 to 750,000, 3s. to 3s. 3d.; 750,000 to 1,000,000, 2s. 11d. to 3s. 2d.; one million to two million, 2s. 10d. to 3s. 1d.; two millions upwards, from 2s. 9d. to 3s. By prepayment meter, from 3s. 4d. to 3s. 6d.; by prepayment meter with cooker, from 3s. 7d. to 3s. 9d. The terms for supplies outside the city are: Stourton, raised from 3s. 10d. to 4s. 1d. by ordinary meter, and from 4s. 5d. to 4s. 7d. by prepayment meter with cooker; Adel, by ordinary meter, raised from 3s. 11d. to 4s. 2d. The suggested increase for motive power and furnaces is from 2s. 3d. to 2s. 6d. per 1000 c.ft. It is proposed that the changes take effect as from the last meter-reading in June.

MISCELLANEOUS NEWS.

THE NEW FUEL AND LIGHTING ORDER.

A meeting of Trade Journalists was held at the Institute of Journalists in London on Friday last, when Sir Guy Calthrop, Bart., the Coal Controller, explained the new fuel order. Mr. L. GASTER was in the chair.

Sir GUY CALTHROP said that the Lighting and Heating Order which was issued at the end of March might not have been a very scientific document, but it had to meet an emergency which was forced upon them with practically no notice at all. This emergency rendered it imperative to reduce the consumption of gas and electricity in the South; and the decision that had to be given came at the very worst possible time for the public-utility undertakings in London. In March, the stocks of coal held by these undertakings were naturally at the lowest; and the situation was very awkward. He was glad to say that they pulled through, however, and stocks were being slowly built-up again. But he did not think for an instant that by next October or November, when the heaviest demands would again come on, that the stocks of coal in the hands of the large undertakings would be anything like what they were last year. In London, last winter, coal was rationed so far as private users were concerned, and no account was taken of the facilities which the public had in their homes for using gas or electricity. This was because the position as regards coal was very different from what it was now. It was essential now to take into account everything that would economize in the amount of coal consumed; and after a great deal of discussion with the gas and electricity authorities—to be quite frank, he ought to say that the figures that had been arrived at had not been entirely with their concurrence, because they would have liked higher figures—it had been decided that 15,000 c.ft. of gas or 800 units of electricity should be the equivalent of one ton of coal, and that there should be a fuel ration, in place of the order issued in March, which would include the consumption of all, whether it be coal, gas, or electricity. The proposal that was going to be adopted was that the consumer would be informed of the amount of gas or electricity that he had used previously; and he would be told the amount, according to the size of his house, of fuel ration which he would be allowed under the new Order. He would then be permitted to elect what proportion of this fuel ration he would take in gas, electricity, or coal; and the consumer would be a free agent in the matter. It was recognized that a scheme like this could not be worked from London. The scheme would affect all parts of England, Scotland, and Wales; and it was proposed to set up District Committees which would be representative of the local authority, the gas, electricity, transport, and coal trades in the districts. These Committees would be armed with very full powers. There would also be rationing of coal for industrial purposes; and he was afraid that those industries which were not doing anything directly in connection with the war might have to suffer. The Coal Control Department would consult all the authorities in connection with the various trades, so that the least inconvenience and hardship should arise.

A number of questions were asked at the conclusion of Sir Guy Calthrop's opening remarks.

In reply to Mr. PATERNOSTER ("Truth"), Sir Guy said that the question of the further restriction of public lighting was a matter for the Board of Trade and the Chief Commissioner of Police in London. The Chief Commissioner, for what he was bound to say appeared to him extremely good reasons, deprecated any further reduction in the amount of street lighting; but the Board of Trade, the Home Office, and the Chief Commissioner were going into the question.

Mr. WEBB ("Motor Car") said that, in view of the lower quality of gas now supplied, he wondered how much the 15,000 c.ft. would really repreesnt from the heating point of view.

Mr. F. W. GOODENOUGH said that the actual drop in the calorific value of Metropolitan gas at the present time was in the neighbourhood of only 6 or 7 p.ct., and the fact that the output of the companies showed an increase and not a decrease, in spite of the heavy consumption for munitions purposes, certainly indicated that there was no effect upon the average consumer by the drop in the calorific value. The difference of value in gas was absolutely inappreciable, except by scientific instruments used in the testing room.

Mr. A. F. BEZANT pointed out that the scheme took no account of the coke resulting from the carbonization of a ton of coal. The 12,000 or 13,000 c.ft. of gas obtained from a ton of coal left 10 or 11 cwt. of coke. The Controller was allowing only 3000 c.ft. of gas for this; and this fell far short of the heating value of half a ton of coke.

Sir GUY CALTHROP said it was highly improbable that coke could be employed in most domestic houses; but where he could be sure that a supply of coke would be available, it would be made compulsory that houses of a certain size should take a certain proportion of their fuel in coke. It was anticipated, however, that there would be a far larger demand for coke for industrial purposes than for domestic use.

Mr. BEZANT: So long as we are not asked to regard the 15,000 c.ft. as being equivalent to a ton of coal, that is all right.

Mr. SPEARER suggested that the consumer would want some clear guidance as to the best way to utilize his ration, so that he could decide whether to employ coal gas or electricity.

Mr. F. W. GOODENOUGH, speaking with regard to the relative financial advantages as between gas and coal, pointed to the savings which the use of gas rendered possible as regards labour and dirt. These were considerable, especially in times when labour was as scarce as it was now.

Mr. P. ROBERTSON asked if, in the all-gas house, a man using only gas and having a ration of 5 tons of coal got the same value in his 75,000 c.ft. as the man who used coal only.

Sir GUY CALTHROP said that, speaking scientifically, perhaps he did not; but it was necessary to try and do the fair thing as between coal, gas, and electricity. On the whole, it was not unfair to say that

if a person elected to take all his fuel in gas, he was not unfairly dealt with in regard to what he could get out of it.

There were a number of other speakers (including Mrs. Cloudesley Brereton). Answering further questions, Sir Guy said that it was essential to save 8,000,000 tons of coal consumed for domestic purposes. Three tons of coke would be reckoned the equivalent of two tons of coal. As regards the amount of gas or electricity per ton of coal—viz., 15,000 c.ft. and 800 B.O.T. units respectively—the department had endeavoured to do the fair thing as between gas, electricity, and coal. It would not do for him, for instance, to take any action that would put the coal trade out of existence; and on the whole, in deciding upon the equivalents mentioned, he believed they had arrived at a fair decision. He could not say to the public "Turn over to gas" or "Turn over to electricity." Once the gas and electricity works had got all the coal they could take, the only thing to do was to distribute it in order that it might be used for fuel. As to the use of coke for industrial purposes, that was being investigated by one of the Technical Committees of the Coal Conservation Sub-Committee; but he was not aware of the stage they had reached.

A hearty vote of thanks was accorded Sir Guy at the conclusion of the discussion.

PRIMITIVA GAS COMPANY OF BUENOS AIRES, LTD.

Disgraceful Treatment by the Municipal Authorities.

The Annual Meeting of the Company was held last Thursday, at River Plate House, Finsbury Circus, E.C.—Mr. A. E. BOWEN in the chair.

The SECRETARY (Mr. J. M. Macmorran) read the notice calling the meeting; and the Directors' report and accounts were taken as read.

A MELANCHOLY RESULT.

The CHAIRMAN, in moving the adoption of the report and accounts, first referred to the death of Mr. J. D. Pearson, which took place in Buenos Aires in July last year, as well as to the retirement from the Board, on account of ill-health, of Mr. C. J. Hegan. Proceeding, he said the Board had to chronicle another heartbreaking year. It was true the net result was apparently not quite as bad as it was the previous year, when a loss of £25,391 was shown on the year's working, against £744 this time. But this result had only been obtained by the relief secured in respect of the income-tax assessment of 1916-17 of £22,424. So that, after adjusting these figures, the 1916 loss was reduced to £2967, and the 1917 loss was really £23,168. In addition to this, they had again been unable to provide anything for the amortization of the Retiro account, which now had a deficit of £105,000; and, of course, the cumulative preference shares dividend was in arrear to the extent of £250,000. The machinery and plant had been well maintained out of revenue; but the Directors had not been able to provide anything for a depreciation fund, which they ought to have in a business of this kind. This was a truly lamentable state of things, which it had been beyond the powers of the Board to remedy, though they had done everything possible to obtain better treatment from the municipal authorities. After long and very trying negotiations, they were able to arrange for an Arbitration Court to resolve the various questions pending with the Municipality. The Board hastened to acquaint the shareholders with the result as soon as they knew it, by issuing a short circular in February. Indeed, so anxious were they to post the shareholders without loss of time, that they did not wait for the receipt of the full text, with the result that, when it was received, it was found that the total of the fines imposed for bad quality of gas totalled to no less than $5,000,000 paper, instead of $3,000,000 as was understood from the cables and newspapers; and of these fines the Company were finally ordered to pay $200,000 paper—not $100,000 as stated in the circular. Like most arbitration awards it was, to a great extent, a compromise; and, therefore, not altogether satisfactory to either party. But, on the whole, the result was in favour of the Company, as although the Court did not admit their contention that the utter impossibility of obtaining gas coal in anything like sufficient quantity formed a case of *force majeure*, it allowed that it was an unforeseen circumstance when the contract was made, that therefore the Company were not able to maintain the high calorific standard of gas called for by the contract, and consequently were not liable for all the fines imposed upon them. But it was not admitted that the Municipality were liable to the Company for damages, or even for interest, owing to their not having paid the accounts monthly as called for by the contracts. Therefore the Company were still faced by the disastrous position that the Municipality owed about £200,000 (actually £190,000), and that the Company had to borrow from their bankers, and, of course, pay heavy interest, in order to be able to carry on. It was quite clear and evident that they could not continue to do this for long, as it really meant that they were financing the Municipality, and that, unless they could obtain payments of their accounts, they would be compelled to close-down. However, the Local Board and Manager informed them that they had hopes of a settlement soon; and the Board could only pray that they might be right.

DIFFICULTIES WITH MATERIALS AND MEN.

Last year, the Company were only able to obtain 24,800 tons of coal; and this at very high prices, so that they were obliged to resort to hard wood, bran, peat, and sawdust. These substitutes cost very high prices, with the result that the fuel bill in 1917 was £60,466 higher than in 1916; and it would have been very much worse if it were not for the fact that they obtained very high prices for coke. Troubles had not been confined to scarcity and excessive cost of fuels. Labour troubles had been very great throughout the country. The Company's men went on strike for ten days; but the Government were good enough to send naval stokers to run the works. They were, therefore, able to keep up the supplies of gas; and eventually the men gave in, and came back on the old terms. But, of course, the works were very much upset, and expenses were heavy. All the materials used in the business (such, for example, as wrought iron and tin plates for meter repairs) had cost extraordinarily high prices—in many cases, five or six times more than in 1915. It was a daily wonder to him how, under all these adverse circumstances, Mr. Angus, the General Manager, had been able to keep the business going. Notwithstanding all the Board on this side could do, they could not obtain permits to ship necessary materials from England. They had gone all over the world for them, even as far as Japan. Creosote oil had been brought by railway from Chile; and until lately they were able to obtain some goods from the United States.

GAS AND CHEMICAL REVENUE—NEWSPAPER AGITATION.

The decrease in the gas rental was serious, amounting as it did, to £40,892, or 6·53 p.ct.; and it was brought about by loss of customers for private lighting, and the greater quantity of gas used in the public lamps for heating, &c. The price of gas for private lighting was considerably higher than the price for heating; so that if they lost on the private lighting and gained on the heating, it was bad business. Then the bad debts increased by some £2100, principally owing to a newspaper campaign against the Company conducted by people who apparently were resolved to do everything in their power to injure the Company, and help the German Electric Company. Many doubtful payers took advantage of this not to settle their accounts; and the Company had to resort to drastic steps before they could get the propaganda stopped. One of the few bright spots in the business was that the net profit from the chemical branch increased during the year by £17,781 to £35,006; and this, notwithstanding the fact that it had been almost impossible to obtain raw materials. The shortage of coal was a very serious drawback to this section of the Company's business, because the plant was expressly built, and a market made, for coal gas products. In fact, the demand for all the chemical products was much in excess of the supply. As a matter of interest, he might say that the Company manufactured and sold 24 different chemicals.

COMMENTS FROM THE GENERAL MANAGER.

All the foregoing was, he was afraid, very disheartening; but it was no use trying to persuade themselves that the situation was any better than it really was. In summing up his very clear and exhaustive annual statement, their General Manager wrote as follows:

In reviewing the general working results of the past year, and the position of the Company at the present moment, I regret to say that the aspect is still far from being a bright one. It is true that we have now some prospect of obtaining an increase in the price of gas. But when, we cannot say yet; for although we are endeavouring to get the Intendente to consent to the increase being allowed us immediately, it is possible that the whole matter may be again shelved for the consideration of the new Municipal Council which may not be elected until after June.

Three months will have expired on March 28 since the decision of the Arbitration Court was published; and we are still in the same groove, the only difference being that the Municipal outstandings to the Company have increased by another $200,000 paper. Coal is increasing in price, and becoming scarcer. Timber is increasing in price; and due to labour troubles and shortage of wagons, especially on the Government Railways, the demand is in excess of the supply. We have oil on contract up to the end of May. But we have this week been officially advised by our contractors that, in view of their tank-steamers being taken over by the United States Government, they will be unable to quote or supply us with any further oil at the termination of the present contract. We have applied for crude oil to the Argentine Government; but, so far, without success, as in accordance with information received from the Secretary of the Comision de Explotacion, they are already oversold, and are refusing orders daily. As the German Transatlantic Electric Company are now on the Black List, and unable to get supplies from abroad, they feel themselves, at the request of the Intendente Municipal, compelled to give preference to the German Company, which also is a public service—meaning that, as the Primitiva Gas Company is not affected by the Black List, we are at liberty to obtain our requirements from abroad.

A RAY OF HOPE, AND A PAYMENT.

Proceeding, the Chairman said he had some hope that they might soon get to the end of the worst of their troubles. The people in municipal offices who had done the Company so much harm had now been moved to another Government office; and the Lord Mayor at present in office (Dr. Joaquin Llambias) had done, and was doing, his best to help the Company to obtain justice, and their money. It was possible, therefore, that, when the new Municipal Council was elected, probably next month, the Company might be allowed the increase in the selling prices of gas recommended by the Arbitration Court, and that means might be found of paying the Company at least some part of the immense sum the Municipality owed them, so that they might be in a position to continue the business. The payment received from the City Authorities as he was addressing the shareholders last year, was not in cash, but in 7 p.ct. five-year certificates. These were sold at a loss of $28,208 paper, or (say) £2500. But, fortunately, exchange was very high at the time; so the Company got the proceeds over by cable at a profit of about £6500. Perhaps some operation of the same kind might again be possible. He hoped so.

THE IMMEDIATE OUTLOOK.

Having examined the accounts, the Chairman said the whole year was taken up with strife and worry; and he did not know that the present one was going to be much better, although they were now undoubtedly free from some of the worst dangers which threatened them. But the position was very far from being satisfactory. However, the Argentine Republic was very generally prosperous. The harvest just gathered was a remarkably fine one; and the Allies were supplying the tonnage necessary to lift 2,500,000 tons of wheat. What would happen to the enormous maize crop he was unable to say; but he should not be surprised if the Company had to burn a lot of it in their furnaces for want of other fuel. Money was very plentiful in Buenos Aires, and was likely to become even more so, as the people were forced to economize by the fact that most imported goods were no longer obtainable. The German danger was not now as great as it was, because the Company were also unable to obtain coal. But they had secured preferential treatment in regard to Government oil fuel, as the authorities had agreed to supply them with 3500 tons of oil per month. The position of their own once prosperous and popular Company was really a disaster; and he felt it very deeply, because he had been connected with the Buenos Aires gas industry for 35 years. Everything seemed

to be against them at present. For instance, after endless trouble and negotiation, they succeeded in getting away from England a full steamer cargo of gas coals about ten days ago; but the boat was torpedoed, and sunk a few days after she sailed. He had had an analysis made of the share register; and he found that they had 6160 shareholders—50 p.ct. holding less than 50 shares each; 25 p.ct. less than 100 shares, and only 88 held 1000 shares or over. From many letters the Board had received, they knew what an amount of distress and indeed privation had been caused in many homes by their inability to pay dividends. He often wondered whether it had ever occurred to the authorities and the people of Buenos Aires that, by exacting their pound of flesh from the Company, they were causing great suffering to people here who trusted them with their capital, and that for many years to come the very idea of investment in a public utility company in the Argentine would be impossible.

Mr. H. E. JONES, in seconding the motion, said it was quite impossible for the Directors or any thoughtful person connected with any kind of business which had relations with foreign parts to understand the attitude and action of the Municipality of Buenos Aires towards the Company, except upon the presumption that there was the "unseen hand" of their national enemy at work in the matter. He referred from his experience to the better treatment gas companies in England were receiving from Parliament, and those in France and India from the authorities in these countries.

Shareholders expressed their sympathy with the Directors, as well as the opinion that the Company were not receiving the fair play they had a right to expect from such a city as Buenos Aires.

The retiring Directors (Messrs. H. E. Jones and J. C. im Thurn) and the Auditors (Messrs. George A. Touche & Co.) were re-elected.

Votes of thanks were passed to the Local Committee and staff in Buenos Aires and at home; and a similar acknowledgment was made of the services of the Chairman and Board—sympathy being shown with all in their extraordinary anxieties.

WAGES OF GAS WORKERS.

Awards of the Committee on Production.

Particulars of the following awards by the Committee on Production in connection with gas-workers' wages have been notified:

STOKE-ON-TRENT.

The parties to this reference were the Stoke-on-Trent Corporation and the Workers' Union. The claim submitted by consent of the parties was for an advance of 4s. per week, on behalf of the Union's members employed in the gas-works. The men concerned are in receipt of an advance of 16s. per week over pre-war rates, *plus* a bonus of 12½ p.ct. on earnings, in accordance with the award of the Committee on Production of March 27 last. The Committee's decision is that the war-wage advance of 16s. per week now being paid shall be increased to 18s. per week, as from the beginning of the first full pay following May 10.

EDINBURGH AND LEITH UNITED JOURNEYMEN BRASSFOUNDERS.

The parties to this reference were the Edinburgh and Leith Corporations' Gas Commissioners and the United Brassfounders, Turners, Fitters, Finishers, and Coppersmiths' Association of Great Britain and Ireland. The claim submitted was for payment of a bonus of 12½ p.ct. on earnings to brass finishers, as from Oct. 12, 1917. It was claimed by the Union that the men concerned, who are all plain time workers, were entitled to the bonus under Orders Nos. 1061 or 1301 (Statutory Rules and Orders, 1917). Order No. 1061 applies only to skilled engineers and moulders rated at or above the current district time rate for fitters and turners. Order No. 1301 applies to engineering shops, boilershops, or foundries in the establishments specified in the schedule annexed to the Order. The men concerned do not come within either of these Orders. The Committee authorize the payment to the men concerned, aged 21 years and over, of a bonus of 12½ p.ct. on their earnings, which shall not alter or become part of their time rates—such bonus to be payable from the beginning of the first full pay after Jan. 1, 1918. This shall not apply to any workmen in receipt of any allowance or bonus other than—(*a*) an allowance or a bonus wholly dependent on timekeeping; (*b*) an allowance or a bonus (not being a bonus on output) less favourable to the men than the advance of 12½ p.ct. hereby awarded, in which case the existing allowance or bonus shall merge in the 12½ p.ct.; (*c*) war advances given to assist in meeting the increased cost of living since the outbreak of the present war. If any payment has been made to the workmen concerned pending the general consideration of their position in relation to the bonus of 12½ p.ct., whether by agreement or as a result of arbitration, the amount of such payment shall merge in the bonus given by this award; and such bonus shall be in lieu of, and in substitution for, any such other payment.

EDINBURGH AND LEITH CORPORATIONS GAS COMMISSIONERS.

The parties to this reference were the Edinburgh and Leith Corporations Gas Commissioners and the Associated Blacksmiths and Ironworkers' Society; and the claim submitted was for payment of a bonus of 12½ p.ct. on earnings to hammermen employed at the Granton Gas-Works. The Commissioners and the Union agreed in October and November, 1915, that the wages of the employees of the Commissioners, being members of the Union, should rise and fall with the district wages and fluctuations, and in accordance with the standard. The hammermen in question are in the employment of the Commissioners, and are members of the Union; and under Orders Nos. 1061 and 1301 (Statutory Rules and Orders, 1917), the blacksmiths, hammermen, and other engineers generally in the Edinburgh and Leith district, being plain time workers engaged on munitions work, have received the bonus of 12½ p.ct. The decision of the Committee is that the hammermen concerned shall receive a bonus of 12½ p.ct. from the same date, and on the same terms, as blacksmiths and hammermen generally in the Edinburgh and Leith District have received it under Orders Nos. 1061 and 1301.

ILKESTON.

Mr. Macdonald, the Chairman of the Gas Committee, explained at a meeting of the Ilkeston Town Council that, by a recent award of the Committee on Production, the workmen in the department had become entitled to an increase of 4s. weekly in wages, to make up a total advance of 16s. 6d. a week upon pre-war rates. Mr. A. Henshaw stated that there was some dissatisfaction among the men, who were under the impression that they were entitled to another 12½ p.ct., in addition to the 4s. award. He was told they had had a meeting; and unless the award was corrected, it was anticipated they would hand in their notices. Mr. Macdonald pointed out that the Committee's decision was in accordance with the award of the Committee on Production, and the wages had been brought up to all that had been asked for by the district representative of the General Workers' Federation.

NOTTINGHAM GAS UNDERTAKING.

Probable Further Increased Prices.

The annual report of the Nottingham Corporation Gas Committee (noticed in the "JOURNAL" last week) met with ready acceptance at the meeting of the Council on June 3; but satisfaction was somewhat tempered by the Chairman's warning of a further probable rise in prices, rendered necessary under present exacting conditions. There were hearty congratulations forthcoming to Mr. John Wilkinson, the Engineer and General Manager, upon the results of his discriminating work; while the assiduous services of Alderman A. Ball were warmly acknowledged. In the order of business, the Council had been called upon to deal immediately previously with the report of the Electricity Committee, recording a discouraging year's experience, during which no profit had been made. Succumbing to the inevitable, the Electricity Committee had carried a proposal for the addition of 13½ p.ct. upon present prices; making a total increase since the commencement of the war of 33⅓ p.ct. The Gas Committee had no intention, as has been the case with those responsible for the conduct of the Electricity Department, of waiting for a period when loss occurs before setting matters upon a secure financial basis. In moving the adoption of the report, Alderman Ball observed that he wished to make it perfectly clear that the increased profit would not have appeared in the accounts had they been able to pay for renewals, which they ought to have done in the past year. It had, however, been quite impossible to get the materials and labour to keep the works in the condition they would like to have done. What they needed to-day worse than anything else was a new eight million cubic feet holder. Difficulties in connection with the gas undertaking were enormous at the present time. The labour question and the obtaining of supplies of coal became worse every day. During the past year they had been compelled to buy a number of wagons at a very inflated price; and at the present time they had to take their supplies of coal from Durham. The stock of coal available last winter for the undertaking almost ran out. There were several occasions upon which they had only a four-days' supply in hand. The position had not improved. Their stock of coal to-day was something like 50 p.ct. less than it was this time last year. The Committee were doing all they possibly could to increase their stocks. During the past year they had always had some coal up their sleeves; but unfortunately it had melted, and they had none of it to fall back upon. The outlook for the future was really bad. The Committee were anxious to go on as long as they could without raising the price. But it must be remembered that in Nottingham the rates charged had ruled lower than in many other neighbouring towns. Leicester had increased its prices; and many other similarly placed cities had raised prices very much more than Nottingham had done. Mr. Wilkinson had had a most anxious time; and he thought it was right it should be recognized how much they owed to their Engineer at this period.

Mr. H. G. FORD, the Vice-Chairman of the Committee, seconded the adoption of the report, and alluded to the importance of the operations which are being carried out at the Radford works on behalf of the Government.

Mr. MORRIS thought it was a waste that street lamps should in many cases be lighted up to 12 o'clock on bright nights, but

Alderman BALL, in reply, said that the whole of the coal used to produce gas for public lighting in Nottingham last year amounted to only 130 tons; and, if they were to turn out the lamps as suggested, it would mean they would have to employ more lamplighters at double the cost of the gas burned.

The adoption of the report was agreed to.

The accounts again indicate the striking revenue-earning capacity of Nottingham's chief municipal trading undertaking, which, including the £30,000 voted this year, has provided no less thna £349,000 during the last decade in relief of the rates. The highest totals in this connection were supplied in 1912 and the three following years, in each of which £39,000 was allocated in reduction of local burdens, the amount rising from £31,000 in 1909 to £35,000 in the immediately succeeding annual period, and being represented by £32,000 in 1911. Following the four years in each of which the amount reached £39,000, there was a diminution of £4000 in 1916, when the amount supplied by the Committee was £35,000; the grants for this and last year totalling £60,000. But, coincidently, there has been an inevitable rise in the prices charged. The lowest average rate for Nottingham gas in the decennial period here dealt with for purposes of comparison was 2s. 5·06d. in 1913; the amount last year reaching 2s. 9·36d. During the ten years the gross profits totalled £1,173,746; the highest being attained in 1914, when the sum was £131,917. Interest and sinking fund charges, &c., have accounted for over half-a-million in the same period; the exact total for the ten years being £526,221. From modest beginnings the special renewals account has been increased in substantial volume until, with the £30,000 again set aside this year, the total devoted to the purpose in the ten years comes to £146,556—

another salient evidence of the continued conservation of resources to meet the cost of inevitable developments of which the installation of the vertical system at the Radford and Basford works constitutes the most notable features. The policy throughout has been one of consistently sound finance, under which the Committee have always had the satisfaction of being relieved from the doubtful expediency of raising loans. This has been accomplished in face of the constantly increasing general rise in the price of coal, and the no less formidable soaring in wages.

BIRMINGHAM GAS DEPARTMENT.

The adoption of the report of the Gas Committee, at last Tuesday's meeting of the Birmingham City Council, was moved by Alderman Sir Hallewell Rogers, who said the consumption of gas for the year ended March 31 was 850 million c.ft. more than in the previous year, or 7¼ p.ct. more, and an increase of over 25 p.ct., or 2500 millions, compared with the year prior to the war. The increase was principally due to gas used for manufacturing purposes; and it was interesting to know that this load now exceeded the total output of the department in 1880. The result of the past year's trading was a gross profit of £176,374, and a net balance to the borough fund of £30,757, which compared with £166,908 and £26,649 the previous year.

The revenue account showed extraordinary figures, due to the abnormal conditions operating at the present time. For the first time, the total turnover exceeded £2,000,000, and was almost double that of 1914—in fact, the income from residuals alone exceeded the net gas rental of 1914. The revenue from coke only was £545,000—a very considerable item. But it must be remembered that on the debit side there were also records. The cost of coal and oil, for instance, showed a considerable increase, due to the larger quantity of coal carbonized, and also to the higher prices of coal and gas oil. The stock of coal was very low on March 31 compared with twelve months earlier. The Lord Mayor and he had been to the Coal Controller several times on the matter; but that gentleman had diverted a great deal of coal to London which would otherwise have come to Birmingham. Not only this, a great deal of Durham coal was sent to the department, which was very unsuitable and very costly in railway freight. The difficulty of working now was very great; but they were doing their best.

A successor to Captain Hilton as General Manager had not yet been appointed, because, though the Committee had advertised, they had been unable to find anyone suitable for the post. The idea of the Committee was that they should wait until they did find a suitable man. They hoped to get their coal and gas oil for the winter months; but it must be remembered that the output of coal was very much less than it used to be. The net profits of the undertaking would have been considerably higher, had it not been for increased wages, which amounted to £119,000 or £120,000 more than for the previous year.

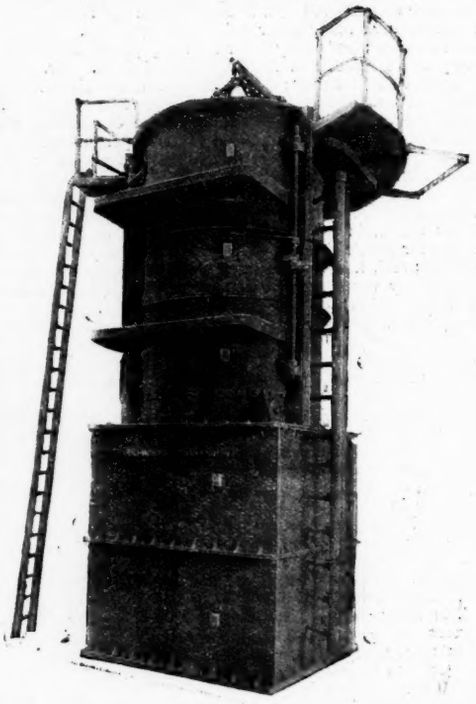
OLDBURY GAS UNDERTAKING.

The annual report and accounts of the Oldbury Urban District Council gas undertaking have been issued by the Engineer and Manager (Mr. Charles H. Carder). He states that interference with coal contracts by the Controller of Mines, with the re-shuffling of sources of supply, qualities, and prices, and the restrictions imposed by other Government Departments on the purchase and use of gas oil, have prejudicially affected manufacturing processes, and considerably reduced their stocks of raw materials during the year. The shortage of labour has been very pronounced; and it has only been possible to continue the uninterrupted supply of gas by the cordial co-operation of all employees, and the assistance of military working parties.

Wages have been increased during the year to meet the continually growing cost of living; and the effect of the award of the Committee on Production will be reflected in the cost of manufacture for the next financial year. Plant for the recovery of benzol, &c., by oil washing has been installed out of revenue, and is working smoothly. Owing to a serious subterranean fire in the adjoining property, the stores and fitting shops had to be demolished in the early part of last winter. They have been replaced by a new block of buildings near the main entrance gates. The abnormally heavy traffic to which the roads have been subjected, owing to war conditions, has been responsible for the repeated fracture of several mains; and though the unaccounted-for gas is reduced by 1·2 p.ct., the proportion is still high. The sales of gas show the very satisfactory increase of 10·1 p.ct.; and it is noteworthy that more than one-half the increase is on slot meters. The consumption through slot meters increased 21·8 p.ct., giving an average consumption per slot-meter of 12,636 c.ft. per annum. Provision has been made in the accounts for the investment of £1000 on sinking fund account in excess of the amount required to be set aside, to compensate for the depreciation in the value of the securities held. The market for residuals has continued good throughout the year; the net revenue from this source being 15s. 5·9d. per ton of coal carbonized, compared with 14s. 7·5d. the previous year, and 8s. 8·6d. in 1915.

The financial results, on the whole, are very satisfactory; the accounts showing a gross profit of £6525, against £6268 the previous year, and a net profit of £2492, against £2249. Manufacture of gas cost £20,037, against £18,189; there being an increase of £1088 in the amount spent on repairs and maintenance. War allowances amounted to £2218, compared with £653. The total expenditure was £27,486, against £23,600. On the other side, sales of gas amounted to £25,204, against £22,288. Public lighting, however, was only £42, against £1108. The total income amounted to £34,012, against £29,868. There were 11,545 tons of coal carbonized, yielding 148,134,000 c.ft. of gas; and 25,886,000 c.ft. of carburetted water gas were made. The leakage and unaccounted-for gas was 16,083,000 c.ft., or 9·2 p.ct., compared with 10·4 p.ct. the previous year. The gas sent out was 174,107,000 c.ft.—an increase of 13,857,000 c.ft., or 8·6 p.ct., compared with 1·27 p.ct. the previous year.

Gas in War Time Industries



No. 5—Ordnance.

Varying in height and capacity, these Vertical Gas Furnaces were specially designed and constructed by Richmonds. This example constitutes but one of the numerous War-time propositions successfully performed in "Richmond" Gas Furnaces.

THE RICHMOND
GAS STOVE & METER CO., Ltd.,
Warrington and London.

BUILDING AFTER THE WAR.

The Committee of the Ministry of Reconstruction who are making an inquiry throughout the country from local authorities, builders, architects, and others, as to the probable demand for, and supply of, building materials during the reconstruction period two years after the war, have extended, until July 1, the date upon which the inquiry forms already sent out are to be returned.

The Committee hope that any authority, person, or firm contemplating building works immediately after the war, who has not received one of the Committee's "Forms of Inquiry," will apply for one either directly or through an architect to the Secretary of the Building Materials Supply Committee, No. 6a, Dean's Yard, Westminster.

In cases where only sketch plans have been prepared, and the preparation of complete plans and bills of quantities has been postponed until after the cessation of hostilities, it would appear that no materials will be required until at least six months after the war, and as regards these works it will suffice if the following particulars are furnished: County; description of building; estimated pre-war value of the work; estimated date of commencement of building; estimated duration of contract. Wherever possible, however, approximate quantities of materials needed should be furnished—especially in the case of building stone and bricks, steel, and timber.

Materials needed for repairs, maintenance, &c., form the subject of a special inquiry; and particulars of these are not needed at present. In other matters, however, it is hoped that every effort will be made to complete the forms of inquiry by the date specified, as unless the Committee are made fully aware of the prospective needs of consumers, it will not be possible to estimate how far the available supplies will meet the demand, and their efforts to secure co-ordination may thus prove unsuccessful.

DR. LEVINSTEIN AND SCHOOL-BOY CHEMISTS.

With the view of guarding boys against the danger of entering blind-alley occupations, and in the hope that the exceptional opportunities offered for advancement will be appreciated, an interesting experiment in continuation school work is now being made at the Blackley (Manchester) Municipal Day Schools, under the guidance of Mr. Benjamin Wilde, the Head Master. Adjoining the schools are the extensive chemical works of Messrs. Levinstein, Ltd., and within a short distance are nearly a dozen other industries in which colours are used more or less. Last September, Mr. Wilde set himself the task of forging a link between the schools and the works, and succeeded—at least, so far as Messrs. Levinstein are concerned; for Dr. Levinstein at once promised to help by providing equipment and funds, as well as by giving every facility to the growing number of youths at the works to attend the classes. At the other establishments boy labour appears to be too scarce for the time being; but there are prospects of future co-operation on the part of some of the employers.

By the end of the second week in January one of the schoolrooms had been converted into a well-equipped laboratory, and some 28 youths, of from 14 to 16½ years of age, began their studies—one-half attending on Mondays and half on Tuesdays. Each student puts in 7½ hours—from 9 a.m. to 12.30, and from 1.30 to 5.30 p.m.—and receives his wages just as though he were at work. While chemistry is the principal subject of study, the classes have not that vocational character against which Mr. Fisher, the Minister of Education, wishes to guard; for the chemistry taught would be equally useful to youths from any of the other works in the vicinity. The subject of chemistry occupies only 2 hours of the 7½ hours. The other subjects are practical mathematics, practical drawing, physics, and English, with a final 45 minutes of Swedish drill.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 10.

In the London tar products market pitch remains in good request, both for home trade and export, at not below 55s. net per ton at makers' works. Solvent naphtha is quiet, and the value is about 3s. 10½d. to 4s. net per gallon into buyers' packages. Anthracene 40-50 p.ct. is worth 6d. per unit per cwt., casks free.

It is understood that orders for sulphate of ammonia for agriculture are being placed through the Food Production Department at the new official prices, and subject to the new regulations.

Tar Products in the Provinces.

June 10.

The average values for gas-works products during the week were: Gas-works coal tar, 27s. 6d. to 31s. 6d. Pitch, East Coast 25s. to 30s. per ton; West Coast—Manchester 25s. to 30s., Liverpool 25s. to 30s., Clyde 25s. to 30s., nominal. Benzol 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha in bulk, North, 7¾d. to 8¼d. Solvent naphtha, naked, North, 3s. 9d. to 3s. 10d. Heavy naphtha, North, 2s. 9d. to 3s. 1d. Creosote, in bulk, North 4d. to 4¼d. Heavy oils, in bulk, North, 4½d. to 5d. Carbolic acid, 60 p.ct. East and West Coasts, 2s. 6d. to 2s. 9d. naked, nominal. Naphthalene salts, £6 to £7, bags included. Anthracene, "A" quality, 4d. to 6d. per unit; "B" quality, 1½d. to 2d.

FROM A MARKET CORRESPONDENT.

Tar Products.

Business remains of very fair proportions; one of the features being the inquiry for pitch for next season. London prices remain at 55s.

NATIONAL KITCHENS

No. 64 "Main" Gas Range.

We invite enquiries for our popular No. 64 "Main" Double Gas Range, as supplied to numerous Public Institutions, Hotels, etc. Let us send you particulars and price of this Range and our other large Apparatus.

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, EDMONTON, N. 18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOWROOMS and BRANCHES: 25 PRINCES STREET, OXFORD CIRCUS, W. 1; 82, Gordon Street, GLASGOW; 18, Severn Street. Deansgate, MANCHESTER; 97, Millfield, BELFAST; 333, Queen Street, MELBOURNE; and 12, Cunningham Lane, Pitt Street, SYDNEY, N.S.W.

per ton; and Provincial quotations are well held, especially on the East Coast. Manchester stocks are still inclined to increase; but prices there keep pretty firm. Fuel oils continue in good demand, and tar is steady at late rates. Carbolic acid is rather a dull market; but creosote is in good request. Benzol and toluol are urgently required for official purposes, and manufacturers are continually being asked to produce to the utmost of their capacity. Solvent naphtha is rather better in Provincial centres—up to 4s. per gallon being obtainable. In London, 4s. 6d. per gallon is about the price, except for large quantities, when manufacturers are prepared to accept a trifle less. There is no fresh news regarding further restrictions on this product; but it is generally anticipated that further regulations will soon be imposed, as manufacturers are not allowed to sell forward beyond the end of this month. Heavy naphtha is just steady. Naphthalenes are rather dull, especially the refined, which, in the absence of shipping orders, makes only £28 to £30 per ton. Crudes appear to have reached bottom for the time being. Aniline oil is on offer, and makes only 1s. 2d. per pound; while anthracene remains at 5d. to 6d. per unit per cwt. Cresylic acid is firm at late rates. The range of quotations is as follows:

Benzol: 90% London, 1s. 0½d., North 10½d. to 11½d.; 50% North 1s. 4d. to 1s. 5d. naked per gallon.

Carbolic Acid: 60% East and West Coast 3s. 6d. per gallon; crystals 40% 1s. 3d. per lb.

Crude Tar: London 32s. 6d. to 35s.; Midlands 27s. to 29s.; North 28s. to 30s. per ton, *ex* works.

Pitch: London 52s. to 55s. f.o.b. works; East Coast, 33s. f.o.b.; West Coast, 31s. f.a.s.; Manchester, 30s.; Clyde 29s.; South Wales 42s.

Solvent Naphtha: Naked London 90-190% 4s. 6d.; North 3s. 9d. to 4s. per gallon; 90-160% naked London 4s. 3d. to 4s. 6d.; North 4s. to 4s. 3d. per gallon.

Crude Naphtha: Naked 30% 8¼d. to 8½d.; North 6¼d. to 6½d.

Naphthalene: Refined £30 to £32 10s.; salts 80s., bags included.

Toluol: Naked, London 2s. 4d.; North 2s. 3d.

Creosote: Nominal, London 4½d.; North 4d. to 4¼d. (Government price, 75s. per ton f.o.b.—equal to 4⅝d. per gallon); heavy oil, 4½d. per gallon in bulk.

Anthracene: "A" quality, 40-45%, 4½d. per unit; "B" quality, 1¾d. to 2¼d.

Cresylic Acid: 95%, 3s. per gallon; 97-99%, 3s. 3d. to 3s. 6d. per gallon, casks included *ex* works London and f.o.b. other ports.

Grease Oils 18° Tw. (naked) £6 per ton f.o.r. makers' works.

Sulphate of Ammonia.

Demand continues on an increasing scale, especially for munitions purposes, and no falling off in this direction is likely for some time to come. At the same time, the agricultural demand is keen, and is almost certain to increase further, owing to the additional land being put under cultivation. Every effort is being made to increase outputs by extending plants; but this process is a matter of time in these days of difficulty in obtaining material. Consequently, manufacturers and others interested are carefully watching the development of the synthetic process adopted by the Government. Some export inquiries have come to hand; the idea apparently being that there will be a small exportable surplus available during the next three or four months. It is difficult, however, to see how such an idea gains credence in view of the continually increasing demands at home.

Increase in Price at Southport.—The Southport Corporation Gas Committee have decided to increase the price of gas from 3s. to 3s. 3d. per 1000 c.ft. An increase of 3d. was made a few months ago.

New Ross (co. Wexford) Gas Company.—A petition has been presented in the Chancery Division of the High Court of Ireland, from the New Ross Gas Company, for leave to extend the objects of the undertaking in respect of the manufacture of electricity as well as of gas. Mr. Justice O'Connor has fixed the hearing for next month.

Lincoln Gas Undertaking.—Moving the adoption of the Gas Committee's report, at a meeting of the Lincoln City Council last Tuesday, Alderman P. Wallis stated that the profits for the past year were £6187, compared with £6259 in the previous annual period. The expenditure had been £8278 more, and £22,525 in excess of that in the year before the war. It was estimated that in the current year coal would cost £2500 more, and wages entail an extra outlay of £1000. It was obvious, therefore, that any further substantial increase in expenses must involve another addition to the price of gas. There is an accumulated fund of £27,391; but a reserve of £30,000 was, he said, needed if the undertaking was to be placed in the position it should occupy after the war. As to complaints about quality, he pointed out that they had been compelled to use more water gas, being unable to obtain the oil they required.

Calcutta Public Lighting Contract.—With reference to the article in last week's issue of the "JOURNAL" (p. 438) on the subject of the recent arbitration proceedings between the Corporation of Calcutta and the Oriental Gas Company, we are informed that the statement that "the Company were to pay a fine of Rs. 500" is incorrect. The facts are these. The Corporation had deducted from a bill for gas rendered by the Company the sum of Rs. 1000 in respect of alleged deficient illuminating power; and the Company disputed the test. The question thus raised had been included among the matters for arbitration; but prior to the first meeting of the arbitrators, the parties came to an agreement as follows: (1) The Corporation to pay to the Company Rs. 500—one moiety of the sum deducted. (2) In future cases of alleged deficiency, joint tests to be taken by the Corporation and the Company. This agreement was reported to the arbitrators, who thereupon recorded the fact, and proceeded to the consideration of the other matters referred to them.

In so far as it relates to Gas Undertakings

The New Fuel Economy Order

may be summed up in seven words:—

"Encourage the Use of DAVIS Gas Appliances"

The Davis Gas Stove Co., Ltd., 60, Oxford Street, London, W. 1.

State Aid for Electricity and Gas Undertakings.

In reply to a letter from the Electrical Engineer to the Leyton Urban District Council, the Secretary of the Incorporated Municipal Electrical Association states that the Association did endeavour to get the Board of Trade to render financial assistance to electrical undertakings in respect of the adverse financial effect of the various Orders which had been made; but he received no encouragement. It was pointed out that, if the expenses had to be borne by the respective undertakings, it might be a charge upon the local ratepayers, which was unfortunate; but if it were paid by the Government, then it would become a charge upon the taxpayers of the country generally, which would mean that the shareholders in gas undertakings, &c., would be helping to bear the burden of electricity departments. This was considered unreasonable; and it would probably simply result in a corresponding application being made for assistance to gas and other companies, when the electrical consumers, as taxpayers, would have to take up part of these burdens. Thus the net result would be no gain to anyone.

Morley Gas-Works Deficit.—At a meeting of the Morley Town Council, last week, Mr. H. J. Hemingway, the Gas Manager, reported a net deficit of £2251 on the working during the year ended March 31 last, which was due entirely to war conditions. The gross receipts had been £23,014, an increase of £1103, and the working expenses had been £16,280, an increase of £2658. The gross profit was £6734, as against last year, £8289. The interest on loans and sinking fund payment had increased from £8404 to £8985, which accounted for the net deficit of £2251, as against last year's deficit of £115. There had been a reduction in the make of gas per ton by reason of the inferior coal, and a consequently reduced yield of tar and ammonia. On the recommendation of the Gas Committee, it was decided that the price of gas should be increased from 3s. 1d. to 4s. per 1000 c.ft. for lighting, and from 2s. 8d. to 3s. 7d. for heating and power. The annual charge of 2s. 6d. for meter-rentals is abolished.

Street Lighting at Manchester.—Alderman W. Kay, J.P., the Chairman of the Manchester Corporation Gas Committee, in moving the minutes of the department at the Council meeting last Wednesday, replying to a suggestion by Mr. J. H. Swales (Deputy-Chairman of the Finance Committee), said the Gas Committee had recently considered the advisability of leaving the lamps in the out-districts of the city unlighted on summer nights. The matter might be left to the Committee to consider some scheme. It was not thought desirable to interfere with the lighting in the centre of the city. Among the papers laid before the Council was the report of the Finance Committee on the annual estimates. Referring to street lighting, the report says: "There is an additional charge for street lighting by the Gas Committee of £1557. The estimated net payments for the year (1917-18) were less than last year by £2880; but, on the contrary, there is a reduction of £4437 in the balance in hand."

The Public Lighting of London.

The Lewisham Borough Council Highways Committee report that they have received further complaints from residents in various parts of the borough and from the local branch of the "Safety-First Council," as to the alleged excessive public lighting. They report that in May last year a letter was received from the Home Office, suggesting, with a view to securing some saving in the consumption of gas for street lighting during the summer months, that certain of the street lamps might be dispensed with—conditional *inter alia* that "sufficient lamps should be retained in lighting for each such lamp to have another lighted lamp within 100 yards of it, either on the same side or the opposite side of the street." On April 23 last, by direction of the Committee, the Home Office was asked to alter or vary this condition so as to leave the question of a reduction of lighting to the discretion of the Borough Surveyor acting in conjunction with the Police Authorities. The lamps in Lewisham are generally fixed at a distance of 60 yards apart; so that the distance between lamps would approximate 120 yards, or 20 yards in excess of the distance proposed. No reply has so far been received to this request, although a further letter was written on the 9th ult. The Committee are strongly of opinion that a considerable reduction might safely be made in the public lighting; and they have directed that a further letter be addressed to the Home Office. In connection with the question of a reduction of lighting, the Committee received a letter on May 23, from the Lambeth Borough Council, forwarding a copy of a letter to the Home Office, asking that the question of putting out of lighting all the public lamps (except in main thoroughfares) during the summer months, with a view to effecting economy in the consumption of gas, may be favourably considered, so as to enable action being taken along the lines indicated. The Committee are not, however, prepared to support this action, as in their opinion such a large reduction in lighting would not be conducive to the public safety.

Bradford Gas Poisoning Mystery.—About midnight on June 2 some form of gas fumes escaped in East Street, Leeds Road, Bradford; and five persons had to be removed to the Infirmary. The next morning a sixth person was affected. The first intimation of the trouble was a strong smell of gas at the house No. 75, East Street. Officials and workmen from the Mill Street Gas-Works visited the road, and announced that the fumes were not those of coal gas. Subsequently the Health Department made investigations. It was assumed that whatever the gas might be, it had got into the houses through the sewers. Samples of the air were taken for analysis; and it has since been officially announced that the cause of the trouble has been discovered, and proper measures taken. Though the authorities have not stated the cause of the trouble, the current theory is that crude gas liquor, possibly from the Birkshall works, may have found a way accidentally into the sewers and so got into the cellars of the houses. A somewhat similar leakage, in practically the same district, occurred in December, 1902; being traced to an underground tank at Birkshall.

NEUTRAL
Sulphate of Ammonia

Before you DECIDE upon any plant for the production of Neutral Sulphate of Ammonia, you will be well advised to investigate the pioneer and most economical process—

The CAPRON NEUTRAL

Full particulars from—

The Capron Neutral Sulphate of Ammonia Syndicate, Ltd.
Registered Offices - - 54, Rathbone Place, London, W. 1.

Shortage of Coal at Glasgow.—At the last meeting of the Glasgow Corporation Gas Committee it was reported that the stocks of coal at the gas-works were exceptionally low at present, and that the gas supply must be restricted unless larger quantities of coal can be obtained from the Coal and Coke Supplies Committee. The citizens are requested to be as economical as possible in the use of gas.

Carnarvon Gas Supply.—Statistics recently presented to the Carnarvon Town Council show the condition of the gas undertaking in the four years 1915-18. The amount of gas sold varied from 32,086,000 c.ft., 32,597,600 c.ft., 34,382,300 c.ft., to 33,225,000 c.ft.; while the quantity unaccounted for rose from 3,978,600 c.ft. (10·22 p.ct.) to 5,029,900 c.ft. (12·9 p.ct.). The cost of coal, per ton, in the four years was 17s. 6d., 21s. 5d., 23s. 11d., and 26s. respectively, while the gas made per ton ranged between 12,300, 12,457, 12,500, and 12,370 c.ft. The price realized for the tar sold having risen from 36s. 7d. per ton in 1915 to 43s. 6d. and 45s. 3d. the two following years, dropped last year to 27s. 10d.

Pilfering of Metal at the South Metropolitan Gas-Works.—At the Greenwich Police-Court last Wednesday, before Mr. Hay Halkett, Thomas Williams, labourer, of New Cross, was charged with stealing from the chemical plant at the South Metropolitan Gas Company's works at East Greenwich 73 lbs. of lead. P.C. Prosser proved stopping the prisoner. He was carrying a sack, in which was a quantity of lead, which he admitted had been stolen from the gas-works. Pleading guilty, the prisoner said if he had not taken the lead it would have gone into the rubbish-heap. This, however, was denied by Mr. Damon (Assistant Manager of the works), who said a man was kept specially to pick up this scrap lead. The prisoner had been employed at the works for two years, at an average wage of £3 7s. 6d. This was prisoner's first offence; and Mr. Halkett fined him £5 or 26 days.

Rationing of Domestic Fuel.—In a letter to "The Times" on this subject "Calorimeter" says: For the sake of those who use gas as a domestic fuel, it is to be hoped that, in the forthcoming rationing scheme, the Coal Controller will allow more than merely 15,000 c.ft. of gas as the equivalent of a ton of coal. A ton of good household coal is capable of developing on combustion about 30 million B.Th.U.; whereas 1000 c.ft. of gas will develop no more than 500,000 such units. Hence, as regards the potential total heat development on complete combustion, a ton of coal is equivalent to 60,000 c.ft. of gas. But, inasmuch as the thermal efficiencies of gas fires and cookers are about twice as great as the corresponding devices for burning coal, it may be said that a ton of coal is effectively equal, in domestic appliances, to 30,000 c.ft. of gas, though it is also true that to produce the latter as much as 2½ tons of coal would have to be carbonized at the gas-works. Perhaps a good way of combining fairly the national interest with that of the individual in the matter would be for the Coal Controller to allow, as the equivalent of a ton of raw coal, 15,000 c.ft. of gas, *plus* the 12 cwt. of coke produced in making it.

Gas Cookery Demonstration at Blackburn.—Under the auspices of the Gas Department, Mr. R. G. Marks has been lecturing at Blackburn on cooking by gas. His principal object he said was to prove that the use of gas is cheap, that gas-ovens can be used without any objectionable odours, and that a variety of foods can be cooked with meat when using the right kind of tin or roaster. The ovens, he claims, can also be used and kept free from grease. Mr. Marks answered many questions at the close of his lectures, and gave many valuable hints.

Portsoy and its Gas Supply.—It may be remembered that about a month ago a report was submitted to the Portsoy Town Council by Mr. William Ritchie, of Peterhead, relative to the introduction of coal gas plant to supersede the existing acetylene gas plant, owing to the impossibility of at present procuring carbide of calcium. Mr. Ritchie recommended a complete new installation on the most up-to-date principle, at an estimated cost of £5000. The Council, however, thought a scheme on a modified scale would meet the requirements of the burgh. They therefore asked Mr. Ritchie to reconsider the matter, and meet the Council again at Portsoy and discuss the whole question. This was done; and after discussion and full explanations Mr. Ritchie said he could not see that any other scheme was practical. So he could not depart from his original scheme and recommendation other than to leave over for (say) another year the erection of a new gasholder. The Council have now come to the unanimous decision that the original scheme submitted by Mr. Ritchie, although costly, would be the cheapest and best in the end—keeping in view the future requirements and developments of the burgh. They resolved that the work should be proceeded with immediately, in stages, at Mr. Ritchie's discretion.

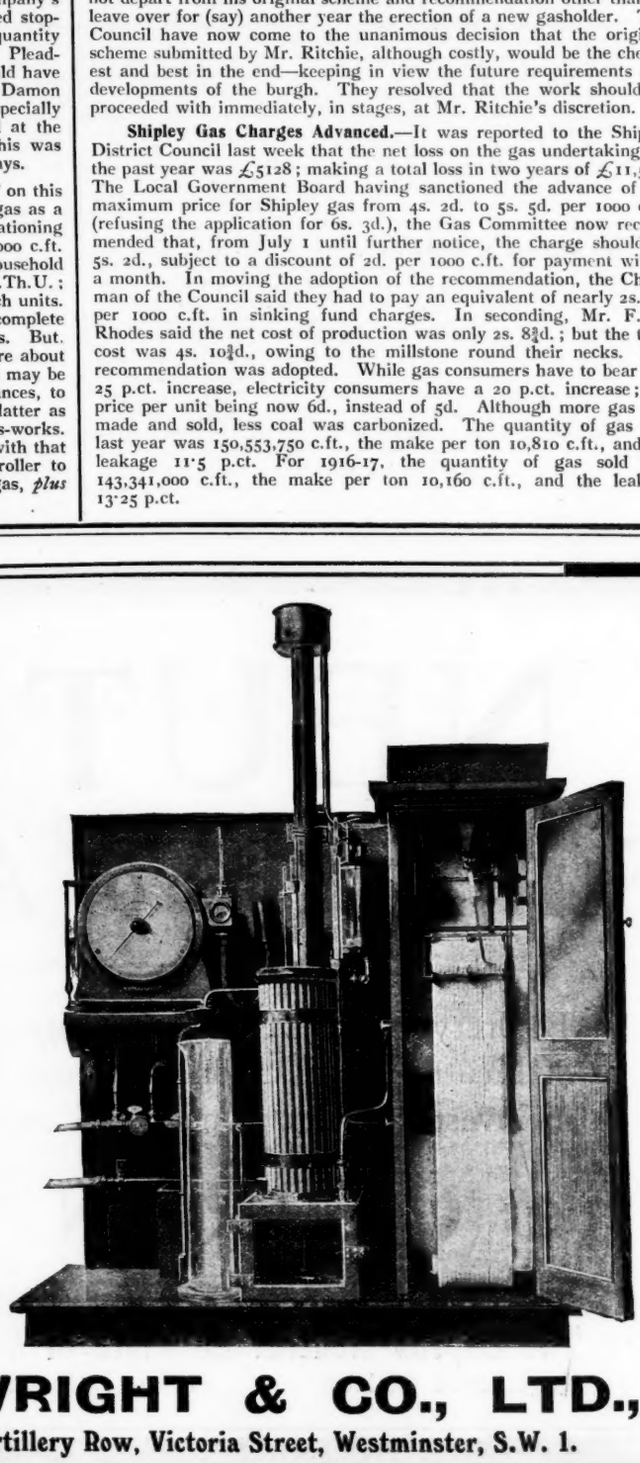
Shipley Gas Charges Advanced.—It was reported to the Shipley District Council last week that the net loss on the gas undertaking for the past year was £5128; making a total loss in two years of £11,589. The Local Government Board having sanctioned the advance of the maximum price for Shipley gas from 4s. 2d. to 5s. 5d. per 1000 c.ft. (refusing the application for 6s. 3d.), the Gas Committee now recommended that, from July 1 until further notice, the charge should be 5s. 2d., subject to a discount of 2d. per 1000 c.ft. for payment within a month. In moving the adoption of the recommendation, the Chairman of the Council said they had to pay an equivalent of nearly 2s. 1d. per 1000 c.ft. in sinking fund charges. In seconding, Mr. F. F. Rhodes said the net cost of production was only 2s. 8¾d.; but the total cost was 4s. 10¾d., owing to the millstone round their necks. The recommendation was adopted. While gas consumers have to bear this 25 p.ct. increase, electricity consumers have a 20 p.ct. increase; the price per unit being now 6d., instead of 5d. Although more gas was made and sold, less coal was carbonized. The quantity of gas sold last year was 150,553,750 c.ft., the make per ton 10,810 c.ft., and the leakage 11·5 p.ct. For 1916-17, the quantity of gas sold was 143,341,000 c.ft., the make per ton 10,160 c.ft., and the leakage 13·25 p.ct.

SIMMANCE'S

Total Heat Recording Calorimeter

¶ The only Recording Calorimeter which combines a Standard Calorimeter and a Recording device.

¶ Simmance's Total Heat Calorimeter is the only Total Heat instrument on the market, and has been adopted for Official Use in England, Canada, Queensland, &c.



ALEXANDER WRIGHT & CO., LTD.,

1, Westminster Palace Gardens, Artillery Row, Victoria Street, Westminster, S.W. 1.

Price of Gas at Newcastle.—The Newcastle-on-Tyne and Gateshead Gas Company announce a further advance of 3d. per 1000 c.ft. in the price of gas, making a rise of 7d. in six months and 1s. since war broke out. The new price is 3s. 1d. per 1000 c.ft.

Satisfactory Results at Carnoustie.—The Carnoustie gas undertaking is in a better position than has been the case for two or three years previously. This was the gratifying announcement made by Bailie James Nicoll (the Convener) when submitting the results of the working to the Town Council. The total income was £7442, and the expenditure £6909, leaving a balance of £533. They started the year with a debit balance of £270, which was now wiped off, leaving them with £155 to carry forward to the new year. In face of manifold difficulties, the result was very satisfactory; and the gas consumers ought to feel gratified. With the outlook now before them, it was impossible for the Council to say whether the price should be further increased. So that the Committee wisely decided to keep to the recent prices of 5s. per 1000 c.ft. for ordinary meters and 5s. 5d. for slot meters, with the reservation that they could call upon consumers to pay more if necessary. In associating himself with Bailie Nicoll's statement, Provost Carnegie said the Convener and the Gas Manager (Mr. J. Ireland) were to be congratulated on the prevailing state of affairs.

Gas Stokers and Military Service.—At the Lancashire Appeal Tribunal, held at the Manchester Town Hall last Wednesday, Mr. H. Darnton Judson, solicitor, appealed on behalf of Michael Kehoe, of Lower Broughton, age 32, married, Grade 2, a gas stoker employed by the Manchester Corporation at the Bradford Road Gas-Works. Up to recently the man was protected; and now he had been combed-out along with several others. The reason Kehoe was combed-out was because at that time he was a class "A" man, and had never been graded under the new groupings. He had since been reduced to Grade 2. Had the National Service authorities ordered the man to be graded before combing him out, he would never have been interfered with at his work. It was ridiculous to take this man away when there was such a shortage of skilled stokers. Captain Clay, the National Service Representative, replied that the man being only 32 would have been combed-out whether he was Grade 1 or Grade 2. In reply to the Chairman (Mr. W. L. Hockin), Mr. Judson admitted that the Corporation did not appeal for their men. He remarked, however, that he did not see why the gas manager at each station should not be allowed to appeal for any workmen he wished to retain, especially having regard to the demands of the Ministry of Munitions for their bye-products. The appeal was dismissed; and the man ordered to report on July 17.

STOCK MARKET REPORT.

THE week just closed on the Stock Exchange has been on a par with, and closely resembling in its most salient features, its predecessor. Its main characteristic was the remarkable strength and steadiness of almost every department—certainly of those which are the most influential and important. The war news from the Western front has been received with much satisfaction, and at the same time without unduly magnifying the importance of the Allies' successful operations as a factor in the solution of the gigantic problem before them. The old complaint—paucity of business—was still the unwelcome feature, and this to a great extent proceeded from the strength of markets; for where few desired to sell, few were able to buy.

The gilt-edged market was very firm. It opened full of buoyancy, and the 5 p.ct. War Loan jumped up 7/16. Some reaction supervened later; but the closing position was steady. Consols and other Home Government issues were very firm, and Indian were in request. Home Rails were very quiet, little except among prior charges being in evidence. Canadians had a much brighter time, favourable views in regard to the progress of satisfactory arrangements with the Government being entertained.

A gratifying feature was the sustained firmness of the Foreign Market, where French were again in demand, and Brazilian and Chilian made further advances. Among the Miscellaneous group, Rubber amended after a poor start; but Oil was in good favour all through. Breweries had quite a new lease of popularity and were strong from start to finish. Among other things that did well were Iron and Steels, Munitions, and Meats.

Business in the Gas Market was still a diminishing quantity. All told, only nine undertakings were dealt in at all, and several of these had but a single transaction apiece—which must be about a record of semi-stagnation. Recorded prices of bargains, however, did not seem to point in the direction of weakness. Gas Light and Coke and South Metropolitan were quite firm. In Provincials, Portsea "C" rose 3 points, Monte Video advanced on the contemplated acquisition of water-works and tramways by the Government, Primitiva was rather weaker, and Imperial Continental was quoted a point lower.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 63¾, 64¼, 64½, Imperial Continental 87, 87⅛, Oriental 102, Primitiva 33s. 3d., 33s. 9d., ditto preference 53s., 53s. 9d., South Suburban 69¼. On Tuesday, Gas Light ordinary 64½, ditto maximum 53½, ditto debenture 55⅝, Imperial Continental 87, 87⅜, Brighton and Hove 6 p.ct. preference 95. On Wednesday, Gas Light ordinary 64½, Imperial Continental 87½, Primitiva 32s. 3d., 32s. 6d., ditto preference 53s., South Metropolitan 65, Brighton and Hove 6 p.ct. preference 95½, Portsea 4 p.ct. debenture 66¼. On Thursday, Continental Union 30, Gas Light ordinary 63½, 64¼, 64½, ditto maximum 54½, ditto debenture 56, 56¼, Imperial Continental 87, 87⅜, 88, South Metropolitan 65½, Aldershot ordinary 62⅝, 63. On Friday, Bournemouth "B" 10⅝, 10¾, Gas Light ordinary 63½, 64½, ditto preference 69½, ditto debenture 56½, Imperial Continental 87, 87½, 88, Monte Video 8¼, 8⅜, 8½, Primitiva 30s., 32s., ditto preference 53s. 6d., South Metropolitan 65, 65⅝.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share.	When ex-Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
182,049	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	55—60	..
1,551,868	,,	April 8	2½	4⅝%	Alliance & Dublin Ord.	59—64	50—55	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	8%†	Bombay, Ltd.	5⅞—6⅜	5½—5⅞	..
50,000	10	Feb. 26	16	18%	Bournemouth Gas and Water { 10 p.c.	29—30	21—23	..
888,110	10	,,	7	7%	B 7 p.c.	15—15½	10½—11	10⅝—10⅞
115,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	9—9½	..
159,740	—	—	—	4%	4 p.c. Deb.	..	67—69	..
992,045	Stk.	Feb. 26	14	4½%	Brentford A Consolid.	261—266	76—79	..
734,930	,,	,,	11	4½%	Do. B New	204—209	70—73	..
65,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	79—84	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	63—65	..
217,380	,,	Feb. 26	11	9%	Brighton & Hove Orig.	208—213	135—140	..
244,200	,,	,,	8	6%	Do. A Ord. Stk.	154—159	95—100	..
530,000	20	Mar. 26	12½	22/6	British	44—45	30—31	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	65—67	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	51—54	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2⅛	3⅜—4½	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	7⅛—8½	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79—81	..
1,518,280	,,	Feb. 12	5/9/4	41/4	Commercial 4 p.c. Stk.	106—108	64—66	..
560,000	,,	,,	5½	36/8	Do. 3½ p.c. do.	103—105	62—64	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	30—35	30
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	60—62	..
278,400	—	—	—	11½%	Croydon B and C 7 p.c.	..	150—160	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5½%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	5/0	European, Ltd.	17½—18	7—8	..
16,398,975	Stk.	Feb. 10	4/17/4	37/4	Gas Light and Coke { 4 p.c. Ord.	98—102	63—65	63½—64½
2,600,000	,,	,,	3½	3½%	3½ p.c. max.	76—79	53—55	53½—54½
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	96—99	68—70	69½
4,674,850	,,	June 11	3	3%	3 p.c. Con. Deb.	72⅛—74½	55—57	55⅝—56½
130,000	,,	,,	10	10%	10 p.c. Bonds	..	..	..
958,740	,,	Mar. 12	5	3½%	Hastings & St. L. 3½ p.c.	87—89	46—51	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅝	7—8*	..
86,600	—	—	—	9½%	Hornsey 7 p.c.	..	115—125	..
181,000	Stk.	Mar. 12	7½	7%	Ilford A and C.	151—154	90—95	..
65,780	,,	,,	6⅝	5½%	Do. B	115—118	70—75	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	63—66	..
4,940,000	,,	May 14	9	4½%	Imperial Continental	150—160	86—89	87—88
1,225,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—68	..
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	82—87	..
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A / B	211—213 / 146—148	82—84	..
306,088	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	71—78	..
76,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅜	3⅜—3½	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	88—99	..
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8—8⅜*	—8
1,875,892	Stk.	July 29	4½	3½%	Newcastle&Gatsh'd Con.	96½—99½	69—71	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	63—64	..
55,940	10	Feb. 26	7/14/0	7%	North Middlesex 7 p.c.	14—15	9½—10½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	101—103	102
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	2—3	..
60,000	50	Feb. 26	13	10%	Portsea, Island B	128—131	82—87	..
100,000	50	,,	12	9%	Do. C	118—121	75—80	..
52,000	50	,,	10	7%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1½—1⅞	30/—33/9
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4⅞—5	2⅛—2½	53/—53/9
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	74—76*	..
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	86—87	57—62	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	7⅛—7⅞	..
125,000	50	July 1	5	5%	5 p.c. Deb.	47—49	40—42	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	..	..
209,984	,,	,,	10	10%	Do. B	223—224	174—177	..
528,500	,,	,,	10	10%	Do. C	220—223	..	..
90,000	10	May 28	9	6/-	South African	10½—11½	9—10	..
6,609,895	Stk.	Feb. 10	5/4/0	40/-	South Met. 4 p.c. Ord.	111—113	64—66	65—65½
—	—	—	—	—	Do. Pref.	..	93—95	..
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	73½—74½	54—56	..
224,890	,,	Feb. 26	8½	6%	South Shields Con. Stk.	157—159	128—130	..
952,795	,,	,,	6	4½%	S'th Suburb'n Ord. 5 p.c.	114—116	69—72	69½
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	73—75	..
135,000	—	—	—	4½%	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	84—86	..
647,740	,,	May 14	5	3%†	Southampton Ord.	99—102	74—76	..
120,000	,,	Feb. 12	7½	5½%	Tottenham and District { A 5 p.c.	135—138	90—95	..
782,275	,,	,,	6	4%	B 3½ p.c.	115—117	67—69	..
181,255	,,	June 26	4	4%	4 p.c. Deb.	87—89	62—64	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	103½—109½	87—88	..
30,000	,,	Feb. 26	8⅜	67/6	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	108—113	..
255,636	,,	,,	6¾	52/6	Do. B 3½ p.c.	129—134	80—85	..
108,075	,,	,,	5/17/3	47/3	Do. C 3½ p.c.	110—115	80—85	..
352,000	,,	,,	6¼	46/3	Wimbledon 5 p.c.	117—122	80—85	..
98,000	,,	,,	6⅜	52/6	Epsom 5 p.c.	121—126	80—85	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66—69	49—52	..

* Ex. Div. † Next Dividend will be at this rate.

Price of Gas at Bradford.—At the meeting of the Bradford City Council to-day (Tuesday) the Gas Committee will recommend that the price of gas for all purposes be increased by 5d. per 1000 c.ft. as from the end of the current half year, and that the existing discount rates shall remain in operation.

Maximum Price at Ossett.—At a special meeting of the Gas Committee of the Ossett Town Council, it was decided that the maximum statutory prices for gas under clause 22 of the Ossett Corporation Gas Act should be increased to 5s. per 1000 c.ft., in place of the present maximum price of 4s., and that the Chairman and the Borough Treasurer be authorized to submit this figure to the Committee appointed to inquire into the desirability of a general increase of maximum prices, &c., if called upon to attend and give evidence before the Committee with regard to the general conditions of gas undertakings.

A suggestion to hold a summer meeting of the Institution of Heating and Ventilating Engineers at York has been abandoned, owing to the small number of members who indicated their intention to attend.

At Dumfries, the Gas Committee are recommending the Town Council that, in view of present war conditions, the salaries of the Manager and clerical staff should be increased as follows: Manager, £300 to £350; cashier, £155 to £200; chief clerk, £120 to £150; lady clerk, £39 to £52.

At the Ripon Tribunal, last week, appeal was made by the National Service Representative for the withdrawal of the exemption of a gas stoker, aged 29 and single, in the Corporation employ. The Gas Manager said that if the man had to go the output of gas would have to be reduced. The National Service Representative held that the interests of the city must take second place to those of the country; and, in answer to the Mayor, who asked if an efficient substitute could be promised, the representative said he could promise nothing. The appeal for withdrawal was granted.

The Leeds General Purposes Committee have increased the war bonus to municipal employees from 15s. to 20s. per week for men over 18, and from 12s. to 14s. for women over 18, to date from last week.

From the end of the current quarter, the price of gas to consumers in the Barnoldswick Urban District Council area will be increased 6d. per 1000 c.ft. The present charges are 2s. 7d. (for power users) and 2s. 9d. per 1000 c.ft.

Appreciation of Mr. Ginman's services as Manager of the Leek Urban District Council gas undertaking has been shown by the granting to him of an advance in salary to £350 per annum, and a war bonus of £50 a year.

At the last meeting of the Manchester Corporation Gas Committee, it was agreed that the bonus of 12½ p.ct. on earnings be extended to bricklayers and bricklayers' labourers in accordance with the building trade award dated April 16.

Glover and Main (Birmingham), Ltd., was the title of a Company registered on May 31, with a capital of £10,000 in £10 shares to trade as manufacturers of and dealers in gas meters, stoves, brackets, and burners, &c. It is a private Company; and the Directors will be appointed by the subscribers.

While working as an acid washer at the Redheugh works of the Newcastle-on-Tyne and Gateshead Gas Company, Robert Lindsay was found lying on the floor, and artificial respiration was resorted to without success. The evidence at the inquest showed that he had been asphyxiated; and the ventilating apparatus is to be investigated, with a view to ascertaining whether any improvement can be effected.

Increased wages have been granted to the gas stokers employed by the Birstall District Council—£1 per week advance on pre-war rates and 12½ p.ct. addition to that. The other gas workers' bonuses have been put up from 15s. to £1 per week also. The wages of the gas workers of the Batley Corporation have been increased as and from March 1 in accordance with the recent award of the Committee on Production.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

GAS ENGINEER AND MANAGER. Chorley Corporation. Applications by June 18.
TECHNICAL ASSISTANT. Nelson Gas Department. Applications by June 25.
JUNIOR ASSISTANT CHEMIST. No. 6457.
DRAUGHTSMAN. No. A5394, nearest Employment Exchange.
COLLECTOR. Aldershot Gas, Water, and District Lighting Company.
BRICKLAYERS. Sheffield Gas-Works.

Appointments Wanted.

ASSISTANT ENGINEER, &c. No. 6460.
MANAGER OR MANAGER AND SECRETARY (GAS OR WATER). No. 6461.

Capital Wanted.

No. 6458.

Patent Licence.

GAS-MANTLES. Haseltine, Lake, & Co., 28, Southampton Buildings, W.C. 2.

Plant, &c., for Sale.

WECK CENTRE VALVE. Wolverhampton Gas-Works.

Plant, &c. (Second Hand) for Sale.

WASHER. Leek Lighting Committee. Tenders by June 25.

TENDERS FOR

Coal.

BAKEWELL URBAN DISTRICT COUNCIL. Tenders by June 29.
HAWORTH URBAN DISTRICT COUNCIL. Tenders by June 24.
LEEK LIGHTING COMMITTEE. Tenders by June 25.

Tar and Liquor.

LEEK LIGHTING COMMITTEE. Tenders by June 25.
NORTHWICH GAS COMPANY. Tenders by June 15.

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